COMMENT RESPONSE DOCUMENT

ADDRESSING THE

NOTICE OF DATA AVAILABILITY
ON
SELECTED SPECIAL WASTES FROM MINERAL PROCESSING

Special Wastes Branch
Office of Solid Waste
U.S. Environmental Protection Agency

May 20, 1991

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NOTICE OF DATA AVAILABILITY FOR THE REPORT TO CONGRESS ON SPECIAL WASTES FROM MINERAL PROCESSING

Prepared for:

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INTRODUCTION

Background

This document is a summary of public comments and EPA responses to those comments, which have been submitted in response to a Notice of Data Availability (NODA) published in January, 1991. The NODA was prepared and made available in response to comments submitted concerning the Report to Congress on special wastes from mineral processing operations published in July, 1990. These wastes are temporarily exempt from regulation as hazardous waste under Subtitle C. As a result of some of the comments, additional analyses were conducted addressing wastes from the production of phosphoric acid, dusts and sludges from carbon steel production, and coal gasification wastes. The materials in the NODA presenting these analyses include several documents, the most substantial of which is Supplemental Information on Phosphoric Acid Production: Alternative Management of Process Wastewater at Phosphoric Acid Facilities (Supplemental Analysis). The public comment period on the Notice formally ended on February 6, 1991. At that time, 18 written comments had been submitted to EPA. Four additional late comments that had been received as of March 5 also have been considered in preparing this document.

Organization and Approach

This report presents a categorized summary of public comments on the Notice of Data Availability as well as EPA's response and analysis concerning the validity and significance of the arguments presented. This introduction describes the Agency's approach (i.e., the summarization and response procedure), outlines the comment categorization scheme, and lists the comments received. The subsequent chapters of the document present the summarized public comments and EPA responses to those comments by specific category (comments on the phosphoric acid sector, the ferrous metals sector, and the titanium tetrachloride sector: no significant comments on coal gasification wastes were submitted). This introduction is not numbered; the following chapters are numbered to correspond to an outline of the comments submitted by The Fertilizer Institute. .This set of comments was used as a structural basis because it addressed virtually all issues raised by other commenters.

In preparing this summary and response document we first read and disaggregated all of the information contained in comments. Next, the individual ideas were organized into categories as presented in comments submitted by The Fertilizer Institute. Within each subject category, the comments were organized into subcategories and, where necessary, headings and subheadings. Each major category is addressed as a chapter of the document. The chapters are divided into sections and, as appropriate, subsections, with Chapters 1-11 containing summarized comments addressing the phosphoric acid industry. Chapter 12 contains comments addressing the carbon steel production and titanium tetrachloride industries. In composing responses to the comments, EPA in many cases addressed several comments related to the same issue with one response. Many of those issues were addressed in the preamble and are also addressed here. It is also important to note that, in regards to comments addressing the document entitled Supplemental Information on Phosphoric Acid Production, EPA has decided to rely only upon proven technologies (e.g., installing liners under waste management units) in developing today's Regulatory Determination. Some of the other technologies that were examined in the Supplemental Analysis have not yet been implemented in the phosphoric acid industry. Commenters have raised a number of issues that, in combination, cast doubt upon the technical feasibility of some of these technologies, and hence, of some proposed Engineering Alternatives. Given severe time constraints and the absence of the types of data required to resolve all of these issues, the Agency has elected to assume that certain technologies are not feasible for costing purposes. This assumption produces a conservative analysis, because further research may demonstrate that techniques such as large-scale lime neutralization are indeed feasible. Consequently, many of the arguments presented are not relevant to today's action.

General Information (Chapter 1)

Chapter 1 contains miscellaneous and introductory summary comments and responses pertaining to the validity of the phosphoric acid Engineering Alternatives, the validity of the EPA and Badger Reports (also contained in the NODA), the use of terms, and facility-specific information submitted by commenters.

EPA's RCRA Regulatory Determination (Chapter 2)

Chapter 2 contains summarized comments and responses concerning EPA's Regulatory Determination. Comments in this chapter include those stating that Subtitle C regulation is warranted, those alleging that full Subtitle C regulation is not appropriate, and those advocating Subtitle D regulation.

FDER Draft Phosphogypsum Management Rule (Chapter 3)

Chapter 3 contains comments and responses addressing the Florida proposed rule concerning the management of phosphogypsum and advocating state regulation of phosphoric acid production wastes.

Florida Groundwater Monitoring Data (Chapter 4)

Chapter 4 contains comments and responses addressing the groundwater monitoring data submitted by the Florida Phosphate Council.

Legal and Policy Issues (Chapter 5)

Chapter 5 contains summary comments and responses addressing various administrative, legal, and policy issues. Section 5.1 contains comments pertaining to the inadequacy of the time period allowed for comments to be submitted. Section 5.2 addresses commenters' concerns regarding the absence of facility and industry cost and economic impacts in the Supplemental Analysis. Comments in Section 5.3 include those addressing the model plant approach and alleging that such an approach is arbitrary and capricious. Section 5.4 addresses the absence of tentative conclusions in the Supplemental Analysis. In Section 5.5 are comments claiming that the Supplemental Analysis relies on assumptions and "working hypotheses." Section 5.6 presents comments claiming that the model plant approach is analytically unreliable. Section 5.7 contains comments suggesting that consideration must be given to all aspects of Subtitle C in making a regulatory determination. Section 5.8 addresses comments stating that the Subtitle C-Minus and D-Plus scenarios cannot be used in making a Regulatory Determination. Finally, Section 5.9 contains comments claiming that the waste management scenarios are not valid under RCRA Section 8002(p).

Regulatory Compliance Issues (Chapter 6)

Chapter 6 contains summary comments and responses addressing regulatory compliance issues, such as compliance with Subtitle C and with other Federal and State regulations. Section 6.1 contains comments addressing the efficacy of the phosphogypsum management alternatives to achieve compliance with Subtitle C, including, in Section 6.1.1, closure and post-closure care of existing phosphogypsum stacks; in Section 6.1.2, accelerated closure and replacement of the existing stack; in Section 6.1.3, collection of stack leachate/run-off in unlined ditches; in Section 6.1.4, management of stack leachate/run-off in lined ponds; and in Section 6.1.5, compliance of the Subtitle C phosphogypsum management scenario with Subtitle C requirements for facilities at which neutralized slurry will exhibit the toxicity characteristic. Section 6.2 contains comments addressing concerns that Subtitle C compliance alternatives for cooling water would not meet Subtitle C requirements, including, in Section 6.2.1, Subtitle C compliance alternatives for cooling water would not meet Subtitle C requirements for many of the same reasons as discussed in connection with phosphogypsum. Section 6.3 addresses comments alleging that the Subtitle C alternatives will not meet other Subtitle C requirements. Section 6.4 contains comments addressing the

management of lime treatment sludge in unlined impoundments. Comments in Section 6.5 are those concerned with the ability of Subtitle C alternatives to comply with the Clean Water Act. Finally, Section 6.6 contains comments addressing the management of phosphogypsum and process wastewater in lined units.

Cost Estimates (Chapter 8)

Chapter 8 contains summarized comments and responses addressing the cost estimates presented in the Supplemental Analysis. Section 8.1 contains comments addressing errors made in calculating the operating year of existing phosphoric acid facilities. Section 8.2 contains comments suggesting that the costs of managing lime treatment sludge have been underestimated. Comments in Section 8.3 are those addressing the absence of consideration of the cost of separating gypsum and cooling water. In Section 8.4 are comments addressing the absence of cost impacts of extra settling area for treated slurry. Section 8.5 contains comments alleging that the capital cost of heat exchangers has been underestimated. Section 8.6 addresses comments concerning the failure of cost estimates to account for new gypsum slurry tank capacity. In Section 8.7 are comments suggesting that the lime requirements have been underestimated. The comments in Section 8.8 are those addressing the absence of differential costs of treatment for toxic wastes. Section 8.9 contains comments addressing the issue of whether or not increasing filter area is economic. In Section 8.10 are comments concerned with the absence of the cost of effects of neutralization on recovery of P_2O_5 from process wastewater. Comments in Section 8.11 address the underestimation of the cost of additional sulfuric acid. Section 8.12 contains comments suggesting that the cost of lost production has been underestimated. The comments in Section 8.13 are those protesting the absence of consideration of the cost of lost efficiency when the model plant is operating. Finally, Section 8.14 contains comments protesting the absence of consideration of the cost of treating excess discharge occasioned by the implementation of Alternative 7.

Economic Effects (Chapter 9)

Chapter 9 contains summarized comments and responses addressing the potential effects on the phosphoric acid industry of increased regulation. These comments include allegations that economic effects were not considered, comments about the economic analysis performed by Jacobs, statements about the effects of regulation on the competitiveness of the industry, concerns that economic losses will result, statements about the impacts of increased regulation outside the phosphoric acid industry, comments regarding the possibilities of passing increased costs on to consumers, concerns about the FSA recovery option, and additional analyses and documents submitted by the commenters.

Extent of Improvement in Environmental Protection (Chapter 10)

Chapter 10 contains summarized comments and responses addressing the extent of improvement in environmental protection precipitated by increased regulation, (e.g., Subtitle C regulation). Section 10.1 contains comments suggesting that implementation of Subtitle C would have perverse environmental effects. Comments in Section 10.2 allege that imposition of Subtitle C will require installation of unreclaimable sludge ponds. Section 10.3 addresses comments concerning the environmental effects of increased demand for lime. Comments in Section 10.4 claim that Subtitle C regulation will increase discharges of treated water. Section 10.5 contains comments addressing the increased volume of phosphogypsum slurry resulting from Subtitle C Regulation. Comments in Section 10.6 are concerned with possible additional ground-water withdrawals resulting from Subtitle C regulation. Finally, Section 10.7 addresses comments alleging that an environmental impact statement would be required to support a Subtitle C regulatory determination.

Trip Reports (Chapter 11)

Chapter 11 contains comments submitted in response to the trip reports included in the Supplemental Analysis.

NODA Comments Addressing Non-Phosphoric Acid Issues (Chapter 12)

Chapter 12 contains NODA comments and responses addressing non-phosphoric acid issues. Section 12.1 contains comments addressing general findings. Section 12.2 contains comments addressing ferrous metals, including industry overview comments in Section 12.2.1; production statistics in Section 12.2.2; and waste characteristics, generation, and current management practices in Section 12.2.3. Section 12.2.4 addresses comments pertaining to potential and documented danger to human health and the environment, including risks and damage cases. Section 12.2.5 addresses waste management alternatives and potential utilization. Section 12.2.6 contains comments addressing findings about specific waste streams within the ferrous sector. Section 12.3 includes comments addressing titanium tetrachloride. Section 12.3.1 addresses potential and documented danger to human health and the environment, including risks.

List of Comments Received

EPA has received and summarized the following comments on the NODA:

Comment Number	Name of Commenter	Code for Commenter
RM2A 00001	United States Senate	
RM2A 00002	The Fertilizer Institute	N-TFI
RM2A 00003	Inland Steel Flat Products	N-INST
RM2A 00004	Seminole Fertilizer Corp.	N-SEM
RM2A 00005	Occidental Chemical Corp.	N-OCC
RM2A 00006	IMC Fertilizer, Inc.	N-IMC
RM2A 00007	Agrico Chemical Co.	N-AGR
RM2A 00008	Gardinier, Inc.	N-GRD
RM2A 00009	Arcadian Corp.	N-ARC
RM2A 00010	Texasgulf, Inc.	N-TEX
RM2A 00011	Agrico Chemical Co.	N-AGR
RM2A 00012	J.R. Simplot Co.	N-JRS
RM2A 00013	Chevron Chemical Co.	N-CHEV
RM2A 00014	The Fertilizer Institute	N-TFI
RM2A 00015	The Fertilizer Institute	N-TFI
RM2A 00016	Florida Phosphate Council	N-FPC
RM2A 00017	Environmental Defense Fund	N-EDF
RM2A 00018	American Iron and Steel Inst.	N-AISI
RM2A 000L1	U.S. Dept. of the Interior	N-DOI
RM2A 000L2	United States Senate	N-RDJE
RM2A 000L3	United States Senate	N-TD
RM2A 000L4	United States Senate	N-SEN

1.0 GENERAL INFORMATION

- Responsible management of phosphate wastes is essential. (N-TD L3:1)

Response:

EPA acknowledges this comment.

- The information and background scenarios presented in the EPA Supplemental Analysis seem to accurately reflect the conditions found in phosphoric acid production. It is supported by data from recent field trips to facilities and from interviews with production personnel. The Engineering Alternatives seem to present reasonable approaches to resolving the waste phosphogypsum disposal and cooling water problems associated with the industry. (N-DOI L1:1)

Response:

EPA acknowledges this comment.

- The Badger and EPA Supplemental Analyses should not be used to make a regulatory determination. The analyses were prepared hastily and thus contain numerous errors and inaccurate assumptions that tend to significantly overestimate the feasibility of Subtitle C regulation while substantially understating the cost and environmental consequences of such regulation. It would therefore be improper to rely on these reports as a basis for a regulatory determination to impose Subtitle C regulation. (N-TFI 15:5)

Response:

EPA acknowledges that the reports were prepared in a short period of time. This brief time frame was necessitated by deadlines beyond the Agency's control. EPA has addressed specific concerns regarding errors and assumptions in its responses to individual comments.

- In the RTC, the Agency uses the term "least-cost option," but in the Supplemental Analysis, this term is replaced with "cost effective." This substitution is objected to. The two terms have entirely different connotations. Determining whether a management alternative is "cost-effective" involves a consideration of what is being achieved for the cost expended; determining which of several alternatives is "least-cost" requires only a comparison of the calculated costs of the various alternatives. The EPA Supplemental Analysis is a "least-cost" analysis; therefore, this term should replace "cost effective" wherever it appears in the Supplemental Analysis. (N-TFI 15:19)

Response:

EPA acknowledges that the analysis performed in the Supplemental Analysis is not a cost-effectiveness analysis, although all of the Engineering Alternatives are intended to achieve the same end from a regulatory standpoint. The cost study in the Supplemental Analysis is a least-cost analysis. EPA believes, however, that this clarification does not alter the substantive content of the Supplemental Analysis or significantly impact its Regulatory Determination.

- A number of commenters provided details about their facilities and operations. (N-OCC 5:1)(N-IMC 6:1)(N-AGR 7:1)(N-GRD 8:1)(N-TEX 10:1)(N-AGR 11:1)(N-JRS 12:1,B,C)(N-CHEV 13:1-2)

  - IMC Fertilizer, Inc., New Wales Operations is the largest phosphoric acid production facility in the United States. (N-IMC 6:1)

- Chevron owns and operates a phosphate fertilizer manufacturing facility located at Rock Springs, Wyoming. The Chevron facility in Rock Springs was constructed in 1985 and began operation in 1986. The facility produces approximately 225,000 short tons of P_2O_5 annually. The plant is equipped with a UCEGO vacuum filter table. The filter is sized for 0.35 tons per day per active square area filtration rate. (N-CHEV 13:1-2)

- Gardinier Inc. is a phosphate mining and processing operation located in Ft. Meade and Riverview Florida. Gardinier produces approximately 1.7 million tons of products that are distributed world wide. (N-GRD 8:1)

- Agrico Chemical Company is the largest U.S. producer of phosphate fertilizers and is a member of TFI. (N-AGR 7:1)

- Occidental Chemical Corporation is a diversified manufacturer with operations in phosphate mining and mineral processing in White Springs Florida (about 70 miles west of Jacksonville). The company employs nearly 2,000 people in Florida. (N-OCC 5:1)

- Texasgulf's Aurora, North Carolina Phosphate Operation mines and mills phosphate ore (12 to 14 million tons per year), producing a phosphate rock product which is converted to phosphoric acid and then sold or further refined into higher grade fertilizer and chemical products. (N-TEX 10:1)

- Agrico Chemical Company is a major U.S. producer of phosphate fertilizer with phosphate mines in Florida and chemical fertilizer facilities in Florida and Louisiana. Agrico owns and operates the South Pierce Chemical Works (SPCW) near Mulberry, Florida, where Agrico operates a phosphoric acid production facility involving the use of process wastewater and the generation of by-product phosphogypsum. (N-AGR 11:1)

- The J.R. Simplot Company is an agri-business firm with 9,000 employees in the western U.S. and Canada. Principal businesses are food processing, agricultural fertilizer, and cattle feeding. The three company facilities affected by the proposed regulation are the manufacturing plant in Pocatello, Idaho, and the Lathrop, California and Brandon, Manitoba, Canada facilities which receive phosphoric acid. (N-JRS 12:1)

- Attachment 2 contains a J.R. Simplot Company Map. (N-JRS 12:B)

- Attachment 3 contains an aerial view of the Pocatello area showing the J. R. Simplot Co. Fertilizer Complex and the FMC Elemental Phosphorous Plant. (N-JRS 12:C)

Response:

EPA acknowledges receipt of these comments. The Agency has not attempted to verify this information, but does not believe that it will significantly impact its Regulatory Determination.

- Several commenters expressed support for concerns raised by other commenters and incorporated those concerns by reference. (N-SEM 4:1)(N-OCC 5:1)(N-IMC 6:1,4)(N-AGR 7:1)(N-ARC 9:1)(N-TEX 10:1)(N-AGR 11:1)(N-JRS 12:1)(N-TFI 14:1-6)(N-FPC 16:1)(N-SEN L4:1)

- A letter was submitted by the senior executives of the companies comprising the American phosphate fertilizer industry. This letter addressed several broad concerns, which are reiterated, in detail, in the TFI comments. (N-TFI 14:1-6)

- The comments submitted by TFI on the NODA are supported and incorporated by reference. (N-SEM 4:1)(N-OCC 5:1)(N-IMC 6:1,4)(N-AGR 7:1)(N-ARC 9:1)(N-TEX 10:1)(N-AGR 11:1)(N-JRS 12:1)(N-FPC 16:1)

- The concerns expressed in the comments submitted by the Fertilizer Institute, the accompanying engineering report, and the February 6 letter to EPA signed by 17 U.S. companies that mine phosphate rock, a calcium ore found in sedimentary deposits from ancient ocean floors, are legitimate. These 17 companies process the phosphate rock into an essential plant nutrient, phosphorus, that can be readily used by our nation's 2 million farmers. (N-SEN L4:1)

Response:

EPA acknowledges these comments. EPA has addressed specific concerns expressed by industry in its responses in this document to individual comments.

Site-Specific Waste Management Comments

Two commenters provided details about management unit liners and stack leachate at their facilities. One of the commenters also disagreed with the Supplemental Analysis' generalization about such liners. (N-GRD 8:3)(N-CHEV 13:8)

- As described in the Chevron comments to the RTC, the gypsum stack and process wastewater pond is lined with a 60-mil synthetic liner and is protected by a seepage collection system, providing adequate protection. (N-CHEV 13:8)

- The Supplemental Analysis incorrectly states that gypsum stacks are typically lined with *in situ* clay (page 17, paragraph 1). This is not correct for all ponds. Also, the references to the new Gardinier stack should indicate that it is already in operation. (N-GRD 8:3)

- Run-off from the Gardinier stack generally has a pH of approximately 6.0 (page 19, paragraph 3). Further, leachate collected by the toe drain system on the old stack has a typical pH range of 2.1 to 2.4. (N-GRD 8:3)

Response:

EPA acknowledges receipt of these comments. The Agency has not attempted to verify this information, but does not believe that it would significantly affect EPA's decision making process.

2.0 EPA'S RCRA REGULATORY DETERMINATION

Support for Subtitle C Regulation

- The supplemental information reinforces the case for hazardous waste regulation of phosphoric acid production wastes for several reasons: (N-NAS/EDF 17:4-5)

  - These wastes pose significant risks to human health and the environment.

  - State regulatory programs governing these wastes are inadequate. Suggestions by EPA in the RTC that states now appear willing to improve their programs remain unsupported. Only one action occurred in one of the 29 states in the 6 months following the RTC. This is a proposed Florida regulation for phosphoric acid production wastes and NAS/EDF believes that Florida is reconsidering the proposal. The lack of state regulation is further proof that hazardous waste regulation is warranted.

  - For 4 of the 7 Alternatives analyzed by EPA in the Supplemental Analysis there is no cost differential between Subtitle C and D regulation as indicated in Exhibit 10 of the analysis presented in the Supplemental Analysis. Therefore, the cost advantages of a continued exemption from hazardous waste regulation for phosphoric acid production wastes are insignificant to the extent they are not totally fabricated by the Agency through the use of creative cost assumptions. As noted in the October 1990 comments addressing the RTC, at the one facility where the phosphogypsum exhibited a hazardous waste characteristic, the cost differential between Subtitle C and D regulation was less than $800,000. This differential would not result in a significant economic impact for the facility. (The Agency assumed in the RTC that phosphogypsum at 11 of 21 facilities would be regulated as hazardous, even though the waste at only one facility exhibited a hazardous waste characteristic. This assumption is contradicted on page seven of the December 1990 analysis stating that phosphogypsum "almost never exhibits the characteristics of EP toxicity".) (N-NAS/EDF 17:4)

Response:

EPA agrees that additional control over the management of phosphoric acid special wastes is appropriate, given the intrinsic hazard of the wastes and the extensive and widespread contamination that has occurred due to current management practices. The Agency does not agree, however, that RCRA Subtitle C (or RCRA generally) is the best and only means of reducing the risks posed by these wastes and practices. As the commenter correctly points out, the cost differences between Subtitle C-Minus and D-Plus programs are in some cases quite modest; they are, nonetheless, costs that would be difficult for the domestic industry to withstand. Consequently, and as described in today's Regulatory Determination, EPA has decided not to regulate the phosphoric acid wastes under Subtitle C and will instead pursue other regulatory options under the auspices of the Toxic Substances Control Act (TSCA).

Opposition to Full Subtitle C Regulation

- Several commenters stated that full Subtitle C regulation is not appropriate because it is financially and technologically infeasible and these wastes pose a low intrinsic hazard to human health and the environment. Furthermore, full Subtitle C regulation would have devastating effects on the phosphate fertilizer industry, and the inflexibility of Subtitle C regulation would not allow for the advancement of state regulatory programs. (N-USS 1:1)(N-OCC 5:1-2)(N-AGR 7:1)(N-GRD 8:5)(N-ARC 9:4)(N-TEX 10:2,10)(N-AGR 11:2)(N-TFI 15:2,3-4,7,120-121)

Response:

EPA agrees that full Subtitle C regulation would be financially infeasible, but does not believe that a decision to regulate the phosphoric acid wastes under Subtitle C would adversely affect the advancement of state regulatory programs. Authorized Subtitle C programs exist in all of the states in question. EPA is confident that these programs could readily accommodate 20 additional facilities.

Regulation of Phosphate Rock Processing Wastes Under Subtitle D, Not Under Subtitle C

- Several commenters stated that, when the phosphoric acid study is supplemented by submitted information, it will have been documented beyond a reasonable doubt that regulation of these wastes as hazardous pursuant to any Subtitle C program (including a Subtitle C-Minus or tailored program) is unnecessary, unwarranted, and counterproductive for various reasons, and the EPA and Badger Analyses contained in the January 7 Notice support this determination. Phosphate rock processing wastes, it was argued, should be regulated under Subtitle D. (N-OCC 5:1-2)(N-AGR 7:1)(N-GRD 8:1,2,5)(N-ARC 9:4)(N-TEX 10:2,10)(N-AGR 11:2)(N-TFI 15:2,3-4,7-10,34-38,120-121)(N-TD L3:1)

Technical Feasibility

- Subtitle C regulation is technically infeasible. (N-GRD 8:5)(N-TEX 10:2,10)(N-AGR 11:2)(N-TFI 15:7)

Response:

EPA agrees that compliance with full Subtitle C regulation, as currently conceived, may be infeasible, given great uncertainty regarding the efficacy and potential operational problems of lime treatment as described in the Supplemental Analysis.

Financial and Economic Issues

- Subtitle C regulation is financially infeasible and would make competitive production of phosphate fertilizer impossible. Extraordinary incremental compliance costs are associated with Subtitle C regulation, and these costs would have a devastating economic impact on the American phosphate fertilizer industry and its contribution to the industrial and employment base of the United States and our country's balance of trade. The effect on industry would damage domestic employment, the American balance of trade, and the supply and cost of agricultural products. (N-AGR 7:1)(N-GRD 8:5)(N-TEX 10:2,10)(N-AGR 11:2)(N-TFI 15:2,3-4,7,120-121)(N-TD L3:1)

- It would appear that a strong case can be made that a Subtitle D listing is appropriate in light of the scientific record and the economic impact that a Subtitle C listing would have on the American fertilizer industry and the American farmer. These issues should be seriously considered in deliberating the regulation of phosphate rock processing wastes. (N-TD L3:1)

- It is uncertain whether Arcadian can operate under any of the proposed alternatives. The last minute information developed by EPA does not contradict its earlier finding that regulation of phosphate rock processing wastes under Subtitle C is unwarranted. (N-ARC 9:4)

Response:

EPA agrees that compliance with full Subtitle C regulation would be financially infeasible for most domestic facilities. The Agency does not believe that an examination of downstream effects (e.g., impacts on consumers of phosphoric acid products) is necessary, given the results of EPA's existing analysis of costs and impacts in the Supplemental Analysis.

Hazard Potential

- Subtitle C regulation is unwarranted by the nature of the wastes. Phosphate rock processing wastes present a low intrinsic hazard and a limited potential for significant migration of hazardous constituents to the environment. Phosphate rock processing wastes therefore present very little threat to human health; (N-AGR 7:1)(N-TFI 15:2)(N-TFI 15:120-121)

- Current practices at Occidental do not pose a health hazard to workers or residents. (N-OCC 5:1-2)

Response:

EPA disagrees with the statements that the intrinsic hazard of the wastes is low, and that there is limited potential for migration of contaminants, hazardous or otherwise. Ground-water monitoring data submitted to EPA by the industry conclusively demonstrate that ground-water contamination has occurred at nearly all active facilities, and in some cases, toxic metals and other contaminants of concern have migrated off-site. These data are summarized in the document entitled Technical Background Document : Data and Analyses in Support of the Regulatory Determination for Special Wastes From Mineral Processing.

Environmental Costs and Benefits

- Negligible environmental benefits would be achieved by Subtitle C regulation as compared to Subtitle D. Subtitle D would provide environmental benefits similar to those achieved under Subtitle C. Regulation of these wastes under Subtitle D will provide protection to the environment as well as the health, safety, and welfare of the public. Appropriate alternatives under Subtitle D can be developed which are economically and environmentally achievable. (N-GRD 8:2,5)(N-TFI 15:120-121)(N-TEX 10:2,10)(N-AGR 11:2)(N-TFI 15:7)(N-TFI 15:3-4)

- Subtitle C regulation would cause real and substantial adverse environmental consequences and would actually increase the potential for environmental release of constituents of concern that are not classified as "hazardous"; (N-TFI 15:120-121)(N-GRD 8:5)(N-TEX 10:2,10)(N-AGR 11:2)(N-TFI 15:7)(N-TFI 15:3-4)

- Subtitle C regulation of phosphate rock processing wastes would actually increase the potential for groundwater migration of non-hazardous constituents. Lime neutralization increases the sodium concentration in the wastes. Furthermore, the potential for groundwater migration is substantially increased by the deposition of sodium and sulfate-rich neutralization sludge into unlined surface impoundments for settling. (N-TFI 15:35-37)

Response:

EPA agrees that there might be unresolved difficulties associated with full Subtitle C compliance, among them the possibility of increasing the concentrations of mobile contaminants in treated

effluent from the neutralization of process wastewater. For this reason, among others, the Agency has not relied upon the engineering alternatives involving extensive lime treatment in developing today's Regulatory Determination.

Relative Flexibility of the Programs

- Due to its inflexibility, regulation under Subtitle C of RCRA would create several problems, including the fact that it would only address constituents of phosphate rock processing wastes that available data indicate are not of significant environmental concern, and it would not address the many site-specific differences, including the nature of the phosphate rock processed and geographic and climatic setting of existing facilities. Regulation under Subtitle D of RCRA, however, would provide the necessary flexibility to address these concerns and to account for site-specific differences in the nature and management of the very large volumes of phosphate rock processing by-products. (N-TFI 15:3-4,7-9)

- The waste management Alternatives addressed in the EPA Supplemental Analysis illustrate the inflexibility of the Subtitle C regulatory program and its inappropriateness for phosphate rock processing wastes. The Subtitle C regulatory program addresses only specifically identified hazardous waste characteristics and hazardous constituents. The program is incapable of addressing, except by chance, the non-hazardous characteristics and non-hazardous constituents of wastes regulated under the Subtitle C program. However, phosphate rock processing wastes can contain significant concentrations of non-hazardous constituents such as sulfate and sodium. Migration of these constituents to groundwater can be cause for concern. (N-TFI 15:34-35)

- Subtitle D regulation would require that the ponds be lined because the leachate from the ponds would violate Florida groundwater standards for sodium and sulfate. Under Subtitle D, regulations can be developed to address not only non-hazardous waste characteristics and constituents, but also characteristics and constituents identified as hazardous under Subtitle C. (N-TFI 15:37-38)

Response:

EPA agrees that implementing the Subtitle C program for phosphoric acid special wastes would be difficult, even using the flexibility afforded by §3004(x). The Agency does not agree, however, that EPA is powerless, using Subtitle C authorities, to control risks from so-called "non-hazardous" constituents. Certainly, in addressing risks posed to ground water, EPA could establish corrective action requirements that specifically addressed the contaminants expected to be present in high concentration in the wastes of interest. EPA could also propose to add these constituents to 40 CFR Part 261 Appendix VIII.

State Regulatory Programs

- EPA should consider, in making its regulatory determination, that the determination called for by § 3001(b)(3)(C) is not a choice between regulation under RCRA and no federal regulation of phosphate rock processing solid wastes. Rather, the regulatory determination requires a decision on the nature of future RCRA regulation of these materials. EPA must also consider the potential effect of its determination on the continuing development of Subtitle D standards for mineral processing wastes, including phosphate rock processing wastes. If EPA decides to impose Subtitle C regulation on phosphate rock processing wastes, a significant delay in the ongoing Subtitle D regulatory process, both site-specific and state-wide, would occur. (N-TFI 15:7-9)

- The EPA should continue to evaluate State programs, such as those in existence in Florida where the management of phosphate fertilizer processing materials is thoroughly regulated by state agencies. The state is currently developing rules establishing construction standards, operating requirements, closure, and financial responsibility for phosphogypsum and process wastewater on new and existing facilities. Subtitle D will provide greater flexibility to recognize site-specific conditions of an operating facility at the state level and will provide the mechanisms for environmental protection. (N-GRD 8:1)(N-AGR 11:2)

- The development of substantive state regulatory programs to implement the federal Subtitle C program will encounter inevitable delay. EPA will be required to:

  (1) make further rulemakings to implement the statutory land disposal restrictions as they apply to the newly identified wastes. Based on EPA's previous rulemaking efforts, there is little evidence that the necessary regulations could be developed within the six-month period provided by RCRA.

  (2) under §3004(x), make decisions whether, and to what extent, to modify Subtitle C regulations developed under eight different subsections of RCRA. It would be difficult to expect § 3004(x) decisions to be made in less than five or more years.

  During this federal rulemaking process, the states and regulated community will face serious regulatory dilemmas. In contrast, a determination to regulate under Subtitle D would cause no disruption in the ongoing Subtitle D regulatory process thereby providing for an uninterrupted development and implementation of a RCRA regulatory program for phosphate rock processing wastes. (N-TFI 15:9-10)

Response:

Though not explicitly required to do so, EPA has considered state regulatory programs in developing the RTC and in response to comments on both the RTC and the Supplemental Analysis. The Agency does not find the arguments presented above convincing, particularly because under RCRA §3004(x), EPA has the authority to modify many of the important provisions of Subtitle C based on site-specific considerations.

3.0 FDER DRAFT PHOSPHOGYPSUM MANAGEMENT RULE

- Two commenters stated that EPA should allow states to regulate phosphoric acid wastes without federal involvement. (N-TFI 15:10-11; N-SEM 4:4)

  - As discussed in October 19, 1990 comments on the RTC, the development and maintenance of strong state mining and mineral processing programs is one of the study factors that §8002(p) of RCRA requires EPA to consider in making its mineral processing wastes regulatory determinations. The draft phosphogypsum management rule developed pursuant to Subtitle D by the Florida Department of Environmental Regulation represents a further evolution of Florida's regulatory program and must be considered by EPA in making its regulatory determination. The imposition of Subtitle C regulation is unnecessary to the development and maintenance of strong state mineral processing waste regulatory programs. The imposition of the inflexible and labyrinthine Subtitle C regulatory program could actually impede the development of strong state programs with the flexibility necessary to address widely disparate site-specific circumstances. (N-TFI 15:10-11)

  - Regulation of phosphogypsum and process water under Subtitle C would impede the implementation of a state program being developed by the Florida Department of Environmental Regulation (FDER) which is designed to address more site-specific concerns of facilities in Florida. Effects on Florida's ground water under current management methods are generally limited to surficial aquifers immediately adjacent to the stacks. The contaminants most commonly seen in these areas are two non-RCRA-hazardous constituents, sodium and sulfate. Florida already has, in place, regulations which require monitoring, reporting, and if necessary, remediation of those areas of concern. Regulation under Subtitle C would do no more to prevent the spread of these *in-situ* contaminants and would, in fact, deplete the industry's resources that would be needed to do the necessary remediation. In addition, FDER's proposed phosphogypsum management rule would address the issue of further contamination by gypsum stacks in Florida. Seminole believes that the interest of the environment will best be served by allowing the state to regulate phosphogypsum and process wastes without federal involvement. (N-SEM 4:4)

Response:

While EPA agrees that Florida's proposed phosphogypsum management rule represents a favorable evolution of Florida's regulatory program, this rule has not yet been adopted and therefore its implementation is not assured. Further, the protective standards in the proposed Florida rule closely resemble EPA's Subtitle C-Minus scenario presented in the RTC and Supplemental Analysis, so that enactment of the standards contained within the Subtitle C-Minus scenario would not impede implementation of provisions contained in the Florida proposed rule. Finally, Florida is only one of six states with phosphoric acid production facilities, and regulatory programs in other states are generally not as protective of ground water as Florida's current regulations. In addition, EPA disagrees with the comment that only sodium and sulfate were detected as significant ground-water contaminants in Florida. A number of other constituents, including some exceeding primary (health-based) drinking water standards, were found in data provided by the Florida Phosphate Council. While FDER's extensive contamination assessment requirements may ultimately lead to a remediation order, no such action has yet been taken despite the fact that off-site contamination has been detected at some facilities.

4.0 FLORIDA GROUNDWATER MONITORING DATA

- One commenter contended that EPA did not review all relevant ground-water monitoring data for Florida, while two commenters contended that only sodium and sulfate migrate any significant distance from the phosphogypsum stack area. (N-IMC 6:3,6)(N-TFI 15:11-14)

  - The results of the most recent two years of ground-water monitoring at Florida phosphate rock processing facilities, collected by the Florida Phosphate Council in 1989, were provided to EPA and, although they were added to the docket, they were neither analyzed nor mentioned in the RTC. A second set of data was provided to the Agency at an October 3, 1990 meeting with EPA staff. An analysis of these data would indicate that the effect of current phosphate rock processing waste management methods on ground water is generally limited to the uppermost aquifer underlying the waste management units and, then, only in the immediate vicinity of those units. The data also demonstrate that phosphate rock processing wastes can contain significant concentrations of constituents (e.g., sodium and sulfate) that are not identified as RCRA "hazardous constituents" and therefore are not addressed by Subtitle C regulation, but are the subject of state ground-water protection standards, including those established by Florida. The suggested Subtitle C compliance alternatives would actually increase the concentration of sodium in phosphate rock processing wastes and would make non-hazardous constituents more available for potential ground-water migration. (N-TFI 15:11-14)

  - The extensive monitoring well data submitted by the Florida Phosphate Council demonstrates that the only two parameters that migrate any significant distance from the existing unlined and untreated gypsum stack/cooling pond systems are sodium and sulfate. (N-IMC 6:6)

  - U.S. Geological Survey and Florida Phosphate Council data demonstrate that sodium and sulfate migrate in the aquifer systems from phosphate processing. Heavy metals, phosphorus, radionuclides, and fluorides are removed by the natural soils. (N-IMC 6:3)

Response:

EPA points out that the Florida Phosphate Council data were reviewed and cited in the damage case portion of the phosphoric acid section (Chapter 12) of the RTC. Since publication of the RTC, EPA has reviewed the Florida Phosphate Council data in more detail. The Agency believes these data support, rather than refute, the conclusion that a number of RCRA-hazardous constituents, as well as other non-RCRA-hazardous constituents, have migrated significant distances from the gypsum stack/cooling pond systems. EPA found the contamination to often extend several hundred feet laterally and sometimes vertically to depths below the uppermost aquifer. EPA agrees with the comment that some of the constituents are not covered by RCRA Subtitle C, although they are covered by state drinking water standards. EPA believes, however, that protective requirements specific to the phosphoric acid industry, as proposed in the Subtitle C-Minus scenario presented in the RTC and Supplemental Analysis, would augment rather than interfere with the protective standards already in place. EPA acknowledges the possibility that some of the proposed Subtitle C compliance alternatives (those relying upon lime treatment) would increase or leave unchanged the availability of non-hazardous constituents for migration. These alternatives, however, were not employed in developing today's Regulatory Determination.

5.0 LEGAL AND POLICY ISSUES

5.1 Adequacy of Time for Comment

- The length of the comment period was insufficient. (N-TFI 2:1)(N-IMC 6:1)(N-AGR 7:2)(N-TEX 10:2-3)(N-JRS 12:7)(N-TFI 15:14-17)

  - EPA has hastily produced a new set of Subtitle C management alternatives that are not mentioned in the RTC for phosphate rock processing wastes. The EPA Supplemental and Badger Analyses were made available to the public less than one month prior to the statutorily required date for the Agency's regulatory determination and only 30 days were provided for comment. A request for extension of the comment period was denied. (N-TFI 2:1)(N-TFI 15:14-17)

  - The short comment period is inappropriate. Because of its detail, the study required more time for analysis. (N-AGR 7:2)(N-JRS 12:7)

  - The 30 day comment period allowed for the NODA was insufficient to address seven technology alternatives, therefore, comment is only made on the three Subtitle C scenarios, the overview, and the IMC Fertilizer trip report. (N-IMC 6:1)

  - The fact that EPA has provided such a short comment period (30 days) to evaluate and respond to the EPA Supplemental Analysis is astonishing. Texasgulf questions whether EPA has not violated the due process of rights of all the participants in these proceedings. Additional time should be given to completely evaluate and submit comments on the Alternatives. (N-TEX 10:2-3)

Response:

EPA recognizes that the relatively short comment period provided made informed and complete comment on the information contained in the NODA difficult. The Agency limited the comment period in this way solely because further extension would have made completion of the Regulatory Determination in compliance with EPA's court-imposed deadline impossible.

- The comment period should be extended. (N-TFI 2:1)(N-TEX 10:10-11)

  - Based on the critical nature of the regulatory determination and the need to analyze and comment on a wide range of complex issues, The Fertilizer Institute requests that the comment period be extended for an additional thirty days, to March 8, 1991. (N-TFI 2:1)

  - If EPA truly believes that its seven Engineering Alternatives are reasonable and feasible, EPA should not object to giving the phosphate companies sufficient time to evaluate the proposals. The consequence, if EPA is correct, is simply a slight delay. On the other hand, if EPA assumptions are incorrect, the phosphate industry could spend hundreds of millions, even billions of dollars for systems that are economically and perhaps even environmentally wasteful. (N-TEX 10:10-11)

Response:

As stated above, extending the comment period would preclude the possibility of the Agency completing the Regulatory Determination in time to meet its deadline. EPA notes that it actually considered all late comments filed.

5.2 Absence of Facility and Industry Cost and Economic Impacts

- The EPA Supplemental Analysis does not analyze the economic effect of the cost of Subtitle C compliance on the American phosphate industry. The EPA Supplemental Analysis ignores the costs of alternatives to current disposal methods and the impact of those alternatives on the phosphoric acid industry, one of the crucial statutory study factors and, therefore, cannot provide a basis for a Subtitle C regulatory determination. Discussion in the EPA Supplemental Analysis is confined to the technical feasibility and relative cost effectiveness of seven new management alternatives at a hypothetical phosphoric acid facility. Without a facility-by-facility analysis of costs and economic impacts, none of the seven alternatives may be used in the regulatory determination as a basis for concluding that Subtitle C regulation is warranted. (N-TFI 15:15,17-20)

Response:

EPA recognizes that the approach used in the Supplemental Analysis is a departure from the facility-specific methods employed in the RTC. The primary purpose of the Supplemental Analysis was to examine and receive comment on the technical feasibility of some waste management alternatives that were not addressed in the RTC, not to present a new and complete analysis of industry-wide costs and economic impacts. In support of today's Regulatory Determination, EPA has computed facility-specific and industry-wide estimates of cost and economic impact. Although these estimates are based upon an extrapolation from the model plant analysis rather than detailed site-specific comparisons of existing and prospective waste management practices, the Agency believes that they are adequate for decision-making purposes.

5.3 Objectivity of Model Plant Approach

- Commenters believed that the model plant arbitrarily overlooked site-specific factors. (N-TFI 15:15,20-21)(N-AGR 7:2)(N-ARC 9:2-3,5-6)

  - EPA's "discussion" of the new alternatives addresses only an assumed model plant - an approach that overlooks site-specific differences between phosphate rock processing facilities recognized in the RTC and/or pointed out in comments on the RTC. A facility-by-facility analysis is necessary. The model plant analysis in the EPA Supplemental Report is contrary to the Agency's own methodology as set out in the RTC and makes it impossible to answer questions that are key to the decision-making process. (N-TFI 15:15)(N-TFI 15:20-21)(N-AGR 7:2)

  - At the model facility, the single gypsum stack did not result in significant regulatory costs. Under Subtitle C, existing stacks that are not currently active could be deemed stacks that are being "actively managed" because of activities required for compliance with environmental regulations under the Office of Solid and Hazardous Waste of the Louisiana Department of Environmental Quality and thus could become subject to full Subtitle C regulation under RCRA. The full cost of managing existing gypsum stacks under Subtitle C would vary from site to site and must be taken into consideration by EPA during the regulatory determination. (N-ARC 9:5-6)

  - One cannot base a major regulatory decision on a model plant analysis when site-specific factors are determinative of both what is possible and what is appropriate. Site specific factors must be considered in Arcadian's case. While the model plant uses the dihydrate process, Arcadian uses a hemi-hydrate process. The implications for lime consumption and plugging of the slurry line under any of the alternatives are immediately apparent. Moreover, because of higher temperatures and acid concentrations in the attack system, relatively more fluoride is released from the reactor and less is available for capture in the evaporators. The implications for lime consumption, feasibility of fluosilicic acid recovery,

sludge generation, and fluoride management generally, under any of the alternatives, are immediately obvious. In Louisiana, where rainfall exceeds evaporation by a significant amount, achieving an annual negative water balance is virtually impossible. The applicability of NPDES guidelines to existing sources in Louisiana was withdrawn by EPA due to high local rainfall. Thus, any alternative that would create additional rainfall collection area or cause the introduction into the system of additional fresh water would exacerbate the water balance problem. (N-ARC 9:2-3)

Response:

EPA reiterates that the model plant approach employed in the Supplemental Analysis was used for purposes of simple exposition and to provide a basis for informed comment on generic technical aspects of selected waste management alternatives, some of which had not previously been examined or discussed. The Agency recognizes that site-specific conditions influence the relative desirability, feasibility, and cost of these (or any other) waste management alternatives, which is precisely why, in the first instance, EPA believed that it was important to develop these alternatives to the simple, uniform approach to waste management presented in the RTC. The Agency did not have sufficient time or information to determine which alternative(s) were most cost-effective for each facility, either for the Supplemental Analysis or in support of today's Regulatory Determination. EPA has instead based its decision on a relatively high cost though proven waste management scheme (Engineering Alternative #3 in the Supplemental Analysis).

5.4 Absence of Tentative Conclusions

- The EPA Supplemental Analysis does not indicate any tentative conclusions EPA may have reached concerning the feasibility, cost, and effectiveness of the new Subtitle C management alternatives, or the potential effect of EPA's new approach on the tentative conclusions stated in the RTC. Absent some analysis of EPA's reasoning and an opportunity to comment, the EPA Supplemental Analysis cannot be used as a basis for a Subtitle C regulatory determination. The Agency must explain the basis of its determination and the logical connection between the facts found by the Agency and the conclusions it reaches. (N-TFI 15:15,21-22)

Response:

The Supplemental Analysis contains few tentative conclusions because many of the ideas presented in the document are new; the Agency wished to receive input from interested parties prior to making decisions as to the desirability of implementing specific engineering alternatives or to the appropriate regulatory status of the phosphoric acid production special wastes.

5.5 Assumptions and "Working Hypotheses" in the Analysis

- Because the model plant analysis relies on assumptions and "working hypotheses," it cannot properly be used as a basis for a Subtitle C regulatory determination. Subtitle C regulation of phosphate rock processing wastes would have a profound effect on the American phosphate industry. EPA assumes, for example, that, although this assumption is a departure from established legal requirements, corrosive phosphate rock processing wastes can be managed in double-lined surface impoundments. EPA thereby overstates the technical feasibility of Subtitle C regulation while substantially understating its cost. (N-TFI 15:22-23)

Response:

EPA disagrees. The Agency has employed model plant analyses on numerous occasions for purposes of regulatory decision-making. EPA does recognize that full Subtitle C compliance for phosphoric acid plants would require a significant change in the Agency's general approach to

regulating the land disposal of corrosive wastes, though this is strictly a legal and not a technical issue. In any event, the Agency has concluded that full Subtitle C regulation is infeasible.

5.6 Analytical Reliability of Model Plant Approach

- The model plant approach was analytically unreliable because it ignored several factors. (N-SEM 4:1)(N-OCC 5:2)(N-JRS 12:5)(N-TFI 15:24-25)(N-TFI/JAC 15:2-3,40)

  - EPA has failed to consider site-specific costs which would increase the estimates yielded by the model plant. Because the Simplot gypsum stack is being constructed on a hillside in a seismic zone 2 or 3 area, it has been necessary to design a gypsum thickener system which reduces the water content of the gypsum being transported to the stack. Simplot currently pumps a gypsum slurry of approximately 35 percent solids by weight to the gypsum stack. This concentration minimizes the amount of water in the stack and eliminates the need for toe drains and drainage ditches around the base of the stack. It also greatly reduces the connection between the cooling water system and the gypsum system. Water from the cooling system is used for makeup water for the gypsum system. (N-JRS 12:5)

  - The model plant approach is analytically unreliable and may not be used as a basis for imposing Subtitle C regulation because of the wide variability in site-specific factors that exist throughout the industry, including environmental setting, availability of land for new construction, and waste characteristics. Any determination to impose Subtitle C regulation must be based on a site-specific analysis of feasibility, cost, and economic effect. The only possible way of obtaining data which can be used as a basis of valid engineering estimates is to collect practical operating values from each site. (N-SEM 4:1)(N-TFI 15:24-25)(N-TFI/JAC 15:2)

  - The model plant used in EPA's calculations omits contaminated rainfall catchment areas. Although this omission is understandable, since such areas are site specific, no major modification to a phosphoric acid complex is ever done without a detailed consideration of its effect on the water balance of the whole complex, as opposed to the battery limits of the phosphoric plant alone. (N-TFI/JAC 15:2)

  - The model omits the interaction with other plants on the site. This omission has a serious effect on EPA's calculations. (N-TFI/JAC 15:3)

  - The model plant procedure is flawed with a host of assumptions such as product mix, size, age, and location. These assumptions have incredible cost and environmental impacts down the line. (N-OCC 5:2)

  - The length of time required to complete Engineering Alternative 2 would be governed entirely by site-specific considerations. Implementation of this Alternative would be expected to require several months more than Alternative 1. (N-TFI/JAC 15:40)

Response:

EPA recognizes that by its nature, a model plant approach is incapable of reflecting all pertinent site-specific factors. EPA did not intend for the Supplemental Analysis either to be or to supplant a complete and precise plant-by-plant analysis. The Agency believes, however, that just as there are site-specific conditions which might increase costs at a particular plant, there are also site-specific conditions which would decrease compliance costs. Accordingly, EPA finds the statements that costs of regulatory compliance have been grossly understated unconvincing. Responses to specific cost-related issues are presented elsewhere in this document.

- The model plant approach is based on flawed assumptions. EPA's flawed model plant assumptions impact on costs associated with neutralization, water imbalances leading to treatment and discharge, recovery of mineral values, plant downtime and production rates, and capital needed for suggested new facilities, as well as many other production factors. One example of a flawed assumption is the model plant production of all merchant grade acid (MGA) at 54 percent P_2O_5 or 75 percent H_3PO_4 containing 25 percent water. There is no market for all the MGA that could be produced if all facilities made it. Therefore, the industry produces dry products and some MGA. This alone favors the base case model plant water balance because of the water exiting with the product. (N-OCC 5:2-3)

Response:

EPA does not believe that the specific product mix of particular plants has any significant bearing upon the technical feasibility or cost of alternative waste management practices, because all plants examined produce MGA, and thereby, generate phosphogypsum and process wastewater at rates and having chemical characteristics that are not influenced to any significant degree by the presence of other on-site production operations (e.g., MAP/DAP or animal feed plants).

- The Engineering Alternatives would differentially impact Louisiana producers. Conditions specific to Louisiana significantly and negatively impact many of the aspects of the Engineering Alternatives discussed in the Supplemental Analysis and compound the errors addressed in the TFI comments. (N-AGR 7:2-3)

  - Congress and the EPA have recognized that Louisiana phosphate producers operate under fundamentally different factors than producers in Florida. Louisiana producers were exempted from the industry's national effluent guidelines because of soils with less load-bearing strength and an excess of rainfall over evaporation. In Louisiana, phosphogypsum cannot be stacked as high, resulting in more gypsum management units per ton of phosphoric acid produced, more land required for gypsum management, and more difficult water management problems. (N-AGR 7:2)

  - The groundwater concerns motivating these alternatives are insignificant. The first aquifer under Agrico's Uncle Sam and Faustina plants is protected by low permeability soil. Therefore, it is highly unlikely that a surface impoundment of any kind would contaminate this aquifer. The contamination described for Louisiana in the RTC is not in the groundwater but is in moisture associated with clays or water trapped in the unconnected lenses of sandy silt and silty sands and is unsuitable for domestic water supply because of its chemical characteristics and limited value and pumpability. This is especially true since almost all area residents use the immediately adjacent Mississippi River for drinking water because it provides a virtually infinite volume of economically treatable fresh water. (N-AGR 7:3)

Response:

EPA recognizes that the desirability of a given compliance alternative may vary widely from plant to plant, or region to region. This was one of the reasons for performing the Supplemental Analysis in the first instance. Had costs been computed on a site-specific basis in the Supplemental Analysis, regional geological and climatic differences would have been taken into account, just as they were in the RTC. The Agency has considered these comments and reviewed available data regarding the hydrogeology underlying the Louisiana phosphoric acid facilities. It is EPA's view that, although irregular, the surficial ground water does constitute an aquifer. Further, EPA does not view the contamination of this ground water as insignificant. At both Agrico facilities there is an extensive network of monitoring wells, all of which are installed within the

surficial aquifer, defined as the uppermost water-bearing zone. These wells show arsenic, radium, sodium, total dissolved solids, sulfate, and chlorides exceeding values from the furthest upgradient wells and MCLs in at least 25 percent of the observations from downgradient wells. In Agrico Uncle Sam's request for a solid waste permit modification, the LA DEQ commented (Leachate Collection System section): "The applicant's operation of the existing stack has resulted in the generation of large volumes of leachate which has migrated into the upper two water bearing zones." In commenting on another item (Provisions to Prevent Contamination section), the LA DEQ stated: "The existing stack has caused a significant impact to groundwater which is not being addressed with corrective action." [Agrico Chemical Company, Uncle Sam Plant - Response to Comments on Solid Waste Permit Modification Request. Submitted to Louisiana Department of Environmental Quality, Solid Waste Division. May 21, 1990.] EPA does not believe that the presence of a clay confining layer precludes the possibility that contaminants will migrate downward to the intermediate aquifer.

5.7 Consideration of All Aspects of Subtitle C

- Commenters stated that EPA should consider corrective action costs. (N-TFI 15:25-28)

  - EPA must give consideration to all aspects of the Subtitle C program. The RTC failed to develop or analyze the costs and economic impacts of a significant number of the requirements associated with the Subtitle C regulatory program, thereby understating the infeasibility, cost, and economic impacts of Subtitle C regulation on phosphoric acid facilities. EPA has committed the same basic error in its analysis in the Supplemental Analysis of the three Subtitle C compliance Alternatives identified in the EPA Supplemental Analysis by failing to consider the costs associated with the RCRA corrective action program. The Agency is in a position to estimate the cost and economic effect of potential corrective action at mineral processing facilities. (N-TFI 15:25-26)

  - The Agency appears to misapprehend the statutory corrective action requirements by stating that management of leachate and runoff may take place "in lieu" of corrective action initiatives. Section 3004(u) of RCRA does not provide for such alternatives. (N-TFI 15:26-27)

  - Unless the Agency is currently proposing to exercise its discretion to relax corrective action requirements for certain mineral processing wastes, the Agency cannot ignore the costs and economic impacts of these requirements. (N-TFI 15:27-28)

Response:

EPA agrees that corrective action is an important component of the RCRA program. Accordingly, in support of today's Regulatory Determination, the Agency has conducted an analysis of likely corrective action costs at all potentially affected phosphoric acid facilities. This analysis is described in a document entitled Technical Background Document : Data and Analyses in Support of the Regulatory Determination for Special Wastes from Phosphoric Acid Production.

5.8 Legitimacy of Subtitle C-Minus/D-Plus for Use in Regulatory Determination

- The "C-Minus" and "D-Plus" scenarios referred to in the EPA Supplemental Analysis cannot be used as a basis for EPA's regulatory determination. Unless the Agency is currently undertaking rulemaking either in connection with the RTC or the EPA Supplemental Analysis to establish C-Minus and/or D-Plus regulatory requirements, the Agency is not in a position to state what those requirements will be. Because the scenarios are hypothetical, the cost analyses of these scenarios are, in turn, hypothetical and cannot be used as a basis for the regulatory determination. (N-TFI 15:28-30)

Response:

EPA disagrees with this comment. Section 3004(x) of RCRA allows the Administrator to modify certain Subtitle C requirements, at his discretion, so as to "take into account the special characteristics" of the wastes in question. Such modifications are "hypothetical" and have not been "established" to the extent that to date, none of the special wastes to which §3004(x) applies have been regulated under RCRA Subtitle C. As discussed at length in the RTC, the Subtitle C-Minus scenarios articulated in the RTC and in the Supplemental Analysis represent realistic (though maximal) application of the regulatory flexibility provided by the statute. The Agency has provided cost estimates for implementation of §3004(x) flexibility because it believes that a tailored Subtitle C program is less costly and burdensome to industry and can more efficiently address the risks posed by phosphoric acid industry special wastes than conventional Subtitle C standards. The Agency recognizes that the contours of a prospective Subtitle D program for mineral processing wastes have yet to be established. Nonetheless, EPA believes that for analytical purposes, it was appropriate to consider one possible approach to such a program, to estimate the costs and impacts that would result from implementation thereof, and to compare these estimates to those of the other regulatory scenarios, in order to develop an understanding of the potential differences between environmentally protective approaches to special wastes management under the provisions of the two potentially applicable portions of the RCRA statute.

- In the case of process wastewater, EPA has not considered what a hypothetical D-Plus scenario would entail; instead the D-Plus scenario has simply been assumed to be identical to the hypothetical C-Minus scenario. (N-TFI 15:30)

Response:

The fact that, in the Agency's view, adequately protective tailored approaches to waste management under Subtitle C and Subtitle D are very similar in terms of requirements and their costs does not in any way invalidate EPA's analysis.

5.9 Validity of Waste Management Scenarios Under RCRA Section 8002(p)

- Alternatives are not available and demonstrated and, therefore, are not a proper basis for a regulatory decision. (N-IMC 6:5)(N-ARC 9:4-5)(N-TFI 15:30-33)

  - None of the waste management scenarios addressed in the EPA Supplemental Analysis is an "alternative" to current waste management practices within the meaning of 8002(p) of RCRA. By definition, to be an "alternative to current disposal methods," a waste management scenario must be available and demonstrated. In the EPA Supplemental Analysis, however, the Alternatives incorporate elements that have not been demonstrated and are, therefore, not alternatives to current disposal methods within the meaning of RCRA. (N-TFI 15:30-33)

  - Untested assumptions on the possible feasibility of an alternative are not a proper basis for making a regulatory decision under RCRA that would impact an entire industry. (N-ARC 9:4-5)

  - The development of alternatives without demonstrating proven technology or factoring in retrofit costs raises concerns. These alternatives were apparently developed in less than two months and a comment period of 30 days is not sufficient to evaluate unproven technology. (N-IMC 6:5)

Response:

EPA largely disagrees with these comments. The commenters' proposed definition of "demonstrated" is contrary to long standing Agency policy. While EPA agrees that there must be an expectation that a given technology will perform adequately if it is to serve as the basis for a regulatory decision, the Agency does not agree that current use of the technology in the industry being examined is necessary. In fact it is very often the case that technologies and techniques that have been developed elsewhere for different purposes are mandated by the Agency for achievement of new pollution control standards. This type of "technology transfer" is at the very heart of such programs as Clean Water Act Effluent Guidelines development and establishment of Best Demonstrated Available Technology (BDAT) requirements under the RCRA Subtitle C Land Disposal Restrictions.

Moreover, EPA wishes to make clear that it believes that the commenters have misinterpreted the Agency's response to the statutory requirement to examine "alternatives to current disposal methods" and "the costs of such alternatives" (RCRA §8002(p), study factors 5 and 6). Essentially, commenters have taken, out of context, a description of one analysis and applied it to a completely different analysis that had different objectives. The intent of EPA's discussion in the RTC of alternatives to current waste management practices was to achieve partial fulfillment of study factors 5 and 8 (potential utilization) by focusing on proven means of source reduction and waste minimization as an alternative to on-site waste management. In contrast, EPA's approach to responding to the remainder of study factor 5 as well as study factor 6 was to articulate and estimate the costs of on-site waste management (i.e., activities conducted after waste minimization has been applied) under alternative regulatory scenarios. Thus, there is no direct linkage between EPA's criterion for discussion of a waste management alternative or opportunity for utilization and the regulatory cost and impact analyses presented in the RTC and the Supplemental Analysis.

- The following technologies have not been demonstrated and are therefore not alternatives under RCRA:

    - the segregation of the integrated system for managing phosphogypsum and process wastewater currently in place at all existing phosphate rock processing plants;

    - the neutralization of phosphogypsum slurry, its deposition on existing phosphogypsum stacks, and the return of decanted phosphogypsum transport water for use in the production of phosphoric acid;

    - in Alternatives 2 and 7, the recovery of hydrofluosilicic acid (FSA) at the reaction stage. Alternatives 2 and 7 assume fluoride recovery from the flash cooler and the reactor fume scrubber. This technology is not practiced at present, chiefly because no means has been found to reduce the P_2O_5 content of the fluosilicic acid sufficiently to make a marketable product. There are also difficulties associated with the formation of silica gel in such systems, increases in water flow requirements, and increases in operating temperature of the phosphoric acid evaporators. This technology is therefore not demonstrated and is not an "alternative" under RCRA.

    - in Alternative 7, the use of cooling towers and indirect cooling using heat exchangers in the management of the cooling and condensation component of process wastewater. (N-TFI 15:30-33)(N-TFI/JAC 15:20-21)

Response:

For reasons discussed above, EPA disagrees with the commenters' proposed definition of "demonstrated" and believes that the commenters have misconstrued the Agency's response to the statutory requirement to examine "alternatives to current disposal methods." With regard to the specific technologies that comprise alternatives 1, 2, and 7, EPA believes that most, if not all, of these technologies have been adequately demonstrated in other industrial applications and that their technical feasibility is not in question. The fact that they are not in use in the phosphoric acid industry is more reflective of an absence of strong regulatory controls or other financial incentives than of the feasibility or availability of the technologies themselves. Specifically, EPA has anecdotal evidence that closed loop cooling and recovery of FSA from the reactor/flash cooler system have been successfully employed in other industries and in foreign phosphoric acid plants, respectively. As discussed further in the relevant sections of this document, EPA acknowledges that there are significant uncertainties regarding the operational consequences of the lime treatment of phosphogypsum, but believes that commenters have based their arguments on an inaccurate interpretation of EPA's analysis. Also as discussed further in this document, EPA believes the issue of segregation of the gypsum management and cooling water areas within a facility's waste management system has been overstated by the commenters.

6.0 REGULATORY COMPLIANCE ISSUES

6.1 Efficacy of Phosphogypsum Management Alternatives to Achieve Compliance with Subtitle C

- EPA's analysis for the Supplemental Analysis of the technical feasibility, cost, and environmental impact of Subtitle C regulation of phosphate rock processing wastes must address a "reasonable worst case" for Subtitle C regulation that includes consideration of all elements of the current Subtitle C statutory and regulatory program. Because they ignore certain aspects of the Subtitle C program, the compliance Alternatives cannot be "efficacious" to achieve Subtitle C compliance. It is incumbent upon EPA to provide some analysis of its apparent position that important elements of the Subtitle C regulatory program would not apply to phosphate rock processing wastes. If EPA intends to make a regulatory determination to impose Subtitle C requirements on phosphate rock processing wastes, the Agency should provide a written explanation of why the Agency believes that certain elements of the Subtitle C requirements would not apply to the phosphoric acid industry. (N-TFI 15:38-40)

Response:

EPA has never suggested that certain Subtitle C requirements would not apply were the Agency to decide that full Subtitle C regulation is appropriate for the phosphoric acid special wastes. As stated elsewhere in this document, the Agency never intended the Supplemental Analysis to represent a complete examination of regulatory compliance requirements, costs, and impacts. Rather, the document was prepared to illustrate the technical and cost aspects of some promising alternatives to conventional disposal methods. Those aspects of regulatory compliance that were not addressed in the Supplemental Analysis were either presented in the RTC or in other analyses that are described in a document entitled Technical Background Document : Data and Analyses in Support of the Regulatory Determination for Special Wastes from Phosphoric Acid Production.

6.1.1 Closure and Post-Closure Care of Existing Phosphogypsum Stack

Necessity of Closure and Post-Closure Care for Phosphogypsum Stacks

- The existing phosphogypsum stack will require closure and post closure care pursuant to Subtitle C at the end of its useful life, for one of two reasons. (N-TFI 15:41-44)

(1) The facilities contemplated by the EPA Supplemental Analysis for achieving compliance with Subtitle C standards cannot be designed, engineered, permitted, installed, and made operational within the six months between a regulatory determination to impose Subtitle C requirements and the statutorily required effective date of such a determination. Thus, the existing phosphogypsum stack will still be receiving corrosive and/or toxic wastes and will become a hazardous waste management facility that, at the end of its useful life, will require Subtitle C closure and post-closure care.

(2) The existing phosphogypsum stack would become a hazardous waste storage facility subject to Subtitle C closure and post-closure care requirements because, under EPA's management scheme, the corrosive and/or toxic stack leachate contained within the existing stack will be "actively managed" after the effective date of any Subtitle C regulatory determination. Mineral processing wastes that were "disposed" prior to imposition of Subtitle C regulatory controls as a result of the withdrawal of the Bevill Amendment are not subject to Subtitle C regulation unless they are "actively managed" after the effective date. EPA's management scheme contemplates the physical disturbance of the stack leachate through its drainage and subsequent neutralization. Consequently, the facility would become a Subtitle C hazardous waste management facility subject to closure and post-closure requirements.

Response:

In response to the first point, EPA disagrees that compliance would be required within six months after publication of the regulatory determination. The statute requires only that in today's action, the Agency determine *whether* or *not* Subtitle C is warranted, and does not speak to the establishment of specific requirements. If the Agency were to decide that Subtitle C regulation was appropriate, then it would, over some period of time, propose and promulgate implementing regulations. In actual fact, the point is moot because EPA has decided that Subtitle C regulation is not appropriate. The second point is moot for the same reasons.

- There is no regulatory interpretation that, as stated by the Supplemental Analysis, exempts units from which the waste has been removed from post-closure costs. Units are clean closed, and therefore exempt from post-closure costs, only if all wastes and hazardous constituents have been removed from the units' components, subsoils, contaminated structures, and groundwater. Under these clean closure standards, it would be difficult to clean close a phosphogypsum stack. Thus, to be efficacious to meet Subtitle C requirements, EPA's Subtitle C scheme for managing phosphogypsum must include closure and post-closure care for the existing phosphogypsum stack. (N-TFI 15:44-45)

Response:

For reasons discussed above, EPA does not believe that formal Subtitle C closure of existing stacks would be compelled because of timing reasons. That being the case, the Agency believes that in response to impending Subtitle C regulation, facility operators would develop an effective compliance strategy (through either construction of new units and/or treatment of wastes) and would cease placement of additional untreated wastes on their existing stacks prior to the effective date of implementing regulations.

Alternative 1 Closure and Post-Closure Requirements

- In order to meet the requirements of Engineering Alternative 1, the following sequence of events is necessary: prepare design of sufficient detail to support environmental permit applications and budget-level installed cost estimation; undertake and complete the permitting process; perform final design and engineering and undertake procurement (certain items, such as liners, may require relatively long lead-time delivery, but cannot be ordered until definite agreement is reached with regulatory authority); undertake construction once permits are in place: complete construction and prepare tie-ins with existing system; tie-in and conduct shakedown testing. The minimum duration of time required to implement Engineering Alternative 1 is estimated to be 33 months. (N-TFI/JAC 15:37-40)

Response:

EPA acknowledges receipt of this comment but has not tried to verify it because Alternative 1 has not served as the basis of today's Regulatory Determination.

6.1.2 Accelerated Closure and Replacement of Existing Stack

- Accelerated closure and replacement of the existing phosphogypsum stack prior to the expiration of the stack's useful life would be required under any one of the following three current Subtitle C requirements: (N-TFI 15:46-47)

(1) Because the existing stacks will receive characteristically hazardous waste after the effective date of Subtitle C regulations and will store such waste for approximately 15 years, closure will be

required by 3005(j) of RCRA within four years because existing phosphogypsum stacks could not be retrofitted to meet RCRA minimum technology requirements.

(2) Because existing phosphogypsum stacks would receive their last volume of hazardous waste after the effective date of Subtitle C regulation, they would be required to close within 180 days of the commencement of their receipt of neutralized (non-hazardous) phosphogypsum slurry pursuant to 40 CFR Sections 264.113 and 265.113. Furthermore, existing phosphogypsum stacks would also be required to close because hazardous waste (stack leachate) contained in the phosphogypsum stack could not be removed in a timely fashion.

Response:

See responses provided above regarding closure requirements.

(3) It is likely that existing phosphogypsum stacks would have to be closed and replaced as a result of "source control" imposed pursuant to corrective action requirements.

Response:

EPA believes that the commenter's statement is highly speculative. The Agency's own corrective action cost analysis indicates that closure (i.e., capping) of existing stacks is not likely to be the most cost-effective means of source control. The Agency notes further that the proposed Subtitle C corrective action rule provides for consideration of site-specific conditions in establishing the remedial activities to be conducted, meaning that even under full Subtitle C, capping would not necessarily be required. EPA's analysis of corrective action and associated costs can be found in a document entitled Technical Background Document : Data and Analyses in Support of the Regulatory Determination for Special Wastes from Phosphoric Acid Production .

6.1.3 Collection of Stack Leachate/Run-off in Unlined Ditches

- Collection of phosphogypsum stack leachate/run-off in unlined ditches does not comply with Subtitle C requirements. There appears to be no regulatory interpretation under which corrosive and/or toxic liquid hazardous waste may be collected, over a 15-year period, in an "unlined canal" that circumscribes a waste management unit with a basal area of 150 acres. To comply with existing Subtitle C standards, the collection canal would have to be either a concrete tank, a concrete surface impoundment, or a concrete or metal pipe. (N-TFI 15:47-48)

Response:

EPA has acknowledged receipt of this comment, but notes that any such interpretation will have no effect on today's decision.

6.1.4 Management of Stack Leachate/Run-off in Lined Pond

- Management of phosphogypsum stack leachate/run-off in a lined collection pond would not comply with Subtitle C requirements. EPA's assumption that management of corrosive stack leachate in a lined impoundment would be permitted, notwithstanding the recently promulgated Subtitle C land ban restrictions, is objectionable. The Agency has never taken the position that waste removed from large landfills under CERCLA is somehow not subject to management in accordance with the land disposal restrictions simply because it has been "generated over a wide area" as stated in the Supplemental Analysis for justification of not considering the land disposal restrictions. In analyzing the cost and economic effect of a reasonable worst case Subtitle C scenario, it is improper for the Agency to assume that a major Congressionally imposed part of

the RCRA Subtitle C program will not be applicable to phosphate rock processing wastes. (N-TFI 15:48-49)

Response:

EPA believes that the commenter is incorrect in its contention that the current Land Disposal Restrictions would necessarily apply to phosphate rock processing wastes. While the Land Disposal Restrictions are a major part of the RCRA Subtitle C program, EPA has the authority under Section 3004(x) to tailor these restrictions at its discretion for special wastes. Because the wastes in question would be "newly identified" if removed from the Mining Waste Exclusion, the Agency could conceivably establish new and different Best Demonstrated Available Technology (BDAT) requirements for the phosphoric acid special wastes, rather than use the existing treatment standards for corrosive hazardous wastes.

6.1.5 Compliance of Subtitle C Phosphogypsum Management Scenario With Subtitle C Requirements for Facilities at Which Neutralized Slurry Will Exhibit the Toxicity Characteristic

6.1.5.1 Source of Metals in Process Wastewater

- Contrary to EPA's "belief," the source of metals in process wastewater is the phosphate rock being processed, not phosphogypsum. Phosphogypsum is not a raw material of phosphate rock processing, it is one of the products of the reaction of phosphate rock and sulfuric acid. (N-IMC 6:5)(N-GRD 8:3)(N-JRS 12:2)(N-TFI 15:51-53)

- Consequently, phosphogypsum cannot possibly be introducing metals to the process. The phosphate rock contains virtually all elements found in the Earth's crust, including cadmium, chromium, and other metals. When mixed with sulfuric acid, the rock releases soluble forms of these metals. The dissolved metals in the acid become part of the process wastewater while the phosphogypsum retained in the stack contains relatively insoluble forms of the metals. An experiment conducted by a TFI member company (Chevron) demonstrates the falsity of EPA's "belief." (N-TFI 15:51-53)

- In the last paragraph on page 5 of the Supplemental Analysis, the Agency states that it believes that phosphogypsum is the source of the dissolved metals observed in process wastewaters from some facilities. Although Gardinier's process wastewater does not have dissolved metals at levels of regulatory concern, the Agency's conclusion does not seem reasonable. The phosphogypsum crystals are formed in an acidic reaction process under conditions conductive to metal solubility. As a result, metals are likely to remain in the liquid phase and not be entrained in the gypsum. (N-GRD 8:3)

- EPA postulates in the overview section that phosphogypsum is the source of EP Toxic metals in the process water. The fact that no such leaching occurs is well established in the Bureau of Mines RI 8639 "Assessment of Environmental Impacts Associated with Phosphogypsum in Florida" and RI 8776 "Evaluation of Radium and Toxic Element Leaching Characteristics of Florida Phosphogypsum Stockpiles." (N-IMC 6:5)

- EPA's belief that the source of dissolved metals in the process wastewater is phosphogypsum and that "dissolution and release of these metals is greatly increased through the more or less constant exposure of the gypsum to the highly acidic process wastewater" is incorrect. The filtered gypsum contains raw phosphoric acid in solution as the gypsum leaves the filter. This loss of raw phosphoric acid is the result of inherent inefficiencies in the process. The raw product acid contains the dissolved metals. Because these metals are already in solution, contacting the gypsum with highly acidic water or

rain water will have the same effect. This effect is predominately a washing of the gypsum which washes the metals and soluble phosphates out of the gypsum. In addition, the gypsum does contain small quantities of unreacted phosphate rock which contains the same metals. It is theoretically possible, over long intervals of time, for highly acidic water to react with the phosphate rock associated with the gypsum. Simplot has not experienced this. Simplot has had under drains below the gypsum stack since 1964 and has been unable to detect a measurable increase in the metal content of the acidic water returning to the phosphoric acid plant. (N-JRS 12:2)

Response:

EPA acknowledges that metals are being brought into the system via the phosphate rock, and that the product filtration operation is the primary point of introduction of these metals into the process wastewater stream.

6.1.5.2 Correctness/Relevance of Working Hypothesis

- EPA's working hypothesis postulating that either segregation of phosphogypsum and process wastewater or treatment of phosphogypsum slurry to a pH greater than 2 would prevent phosphogypsum and process wastewater from exhibiting the toxicity characteristic is incorrect and/or irrelevant. Even if EPA's working hypothesis that the separation of phosphogypsum and process wastewater would prevent the exhibition of the toxicity characteristic were empirically accurate, it would be irrelevant unless fresh water was being used in the phosphogypsum and cooling water circuits. This is not the case under any of the Subtitle C compliance scenarios. (N-TFI 15:53-54)

Response:

EPA recognizes that treatment of existing process wastewaters to pH 3.5 may not be completely effective in rendering EP toxic wastewater non-hazardous, at least for certain constituents. Because of this and other outstanding technical issues, the Agency has not relied upon the waste neutralization engineering alternatives in formulating today's Regulatory Determination.

Neutralization of Phosphate Rock Processing Wastes to a pH of 3.5

- EPA's Subtitle C phosphogypsum management scenario does not comply with Subtitle C requirements for facilities at which neutralized phosphogypsum slurry will exhibit the toxicity characteristic of hazardous waste. (N-SEM 4:3)(N-JRS 12:6)(N-TFI 15:49-51)

  - There are at least four facilities at which either phosphogypsum or process wastewater exhibited the hazardous characteristic of toxicity for either cadmium or chromium. EPA recognized in the RTC that these facilities, if regulated under Subtitle C, would incur significantly greater compliance costs than other facilities. In the Supplemental Analysis, this factor is ignored using the Agency's "belief" that dissolved metals in process wastewater come from phosphogypsum and that if the two were separated or if the gypsum were slurried with water and treated to a pH of greater than 2, then phosphogypsum would not exhibit EP-toxicity. Such "beliefs" are not adequate as the basis of a regulatory determination. (N-TFI 15:49-51)

  - Metals, which occur in the phosphate rock, are present in the liquid process water, as well as in the phosphogypsum (contrary to the EPA Supplemental Analysis) and may occur at toxic levels in some facilities. Additional liming would be required to cause the precipitation of these metals out of solution, perhaps as high as pH 8-10 for cadmium. The EPA Supplemental Analysis does not address this requirement. Also, treating the

process water to remove metals would not be allowed under RCRA for facilities that are not classified as treatment, storage, or disposal facilities. (N-SEM 4:3)

- Studies indicate that treatment to a pH of 3.5 will not eliminate the characteristic of toxicity for cadmium, therefore causing the solution to be classified as hazardous waste. The corrosivity was reduced by treatment to a pH of 3.5; but the short duration test could not predict, with an ample margin of safety, if the treated solution had a corrosion rate greater than 0.25 inches per year. If Simplot understands the regulation correctly, when the corrosion rate is greater than 0.25 inches per year, the solution remains "hazardous" due to the corrosivity regardless of the pH of the solution. (N-JRS 12:6)

Response:

Based on the limited information available, EPA agrees that pH 3.5 would not necessarily remove the hazardous characteristic of toxicity, where present. In addition, the commenter is correct in its interpretation of the "corrosivity" hazardous waste characteristic.

- EPA relies on assumptions and hypotheses heavily, including the Agency's "beliefs" concerning the source of metals in phosphate rock processing wastes managed at several phosphoric acid production facilities and the Agency's "working hypothesis" that these wastes will no longer exhibit the toxicity characteristic of hazardous waste when neutralized to pH 3.5. As a result, the Agency ignores the differential cost and economic impact of Subtitle C regulation on the facilities required to manage such waste streams. (N-TFI 15:23-24)

- EPA has gathered no empirical evidence to support its working hypothesis that neutralization to 3.5 will remove metals. Until such evidence is presented, any analysis of the feasibility, cost, and economic impact of Subtitle C regulation on phosphate rock processing wastes must include an analysis of the differential cost impact that would be imposed on facilities whose phosphogypsum slurry and/or process wastewater currently exhibits, or could exhibit, the toxicity characteristic. (N-TFI 15:56)

Response:

EPA recognized in the Supplemental Analysis that its Engineering Alternatives and costs for complete neutralization were tentative. These treatment scenarios, however, do not form the basis of today's Regulatory Determination.

- The results of preliminary experiments to test EPA's working hypothesis indicate that neutralization of phosphate rock processing wastes to a pH of 3.5 may result in sufficient precipitation of chromium to prevent these wastes from exhibiting the toxicity characteristic for that metal but that cadmium is not sufficiently precipitated. According to existing evidence, a pH of 8 to 11 would be required for sufficient precipitation of cadmium. An excerpt from an article entitled "Treatment Technology to Meet the Interim Primary Drinking Water Regulations for Inorganics: Part 3 Concerning Cadmium Removal from Water" from the Journal of the American Water Well Association dated December 1978 was included as Attachment 1 in support of the argument that raising the wastewater to a pH of 3.5 would not be sufficient to eliminate EP Toxicity for cadmium. Consequently, the differential cost impacts for facilities to manage wastes that are EP-toxic for cadmium must be considered. (N-TFI 15:56-58)(N-TFI/Att.1 15:1-2)

- A sample of phosphogypsum was taken and washed with deionized water to ensure there was no free process water in the sample. The sample was then reslurried with process pond water and agitated for 12 hours. Total Chromium in the phosphogypsum was 37 ppm at the start and finish. The pond water went from 30.8 to 30.4 ppm total Chromium from start to finish. There was thus no additional leaching of Chromium in the pH < 1 process pond water. (N-CHEV 13:9)

Response:

EPA acknowledges receipt of these comments. EPA recognizes that it was probably in error when it stated that the source of metals in process wastewater was the phosphogypsum stack. The Agency now believes that the metals are dissolved from the ore in the reactor, and enter the process wastewater stream when unrecovered raw product acid (and any dissolved metals) contained within the gypsum filter cake is slurried with process water. Accordingly, EPA is inclined to agree, based on the limited information available, that lime treatment of EP toxic process wastewater to a pH of 3.5 may not remove the toxicity characteristic, where present.

Scenarios Under the Various Alternatives

- Under Alternatives 1 and 2, cooling water would be recirculated from the existing cooling pond and neutralized to pH 3.5 after its reuse in the plant. The treated water is decanted off the sludge ponds and recycled again. EPA postulates that through this mechanism the existing pond will be raised to a pH of 3.5 in one year. Since the water used in the cooling water circuit is existing cooling pond water being recycled, it will continue to contain whatever metal concentrations it contained before implementation of Subtitle C regulation, unless neutralization to 3.5 is sufficient to precipitate the metals in the existing cooling water. (N-TFI 15:54-56)

- In Alternative 7, the existing cooling pond is not recirculated for cooling purposes but drawn down, over a four-year period, by reuse in the plant for washing the phosphogypsum filters. This use could well increase the concentration of metals. Therefore, the existing cooling water will only cease to exhibit the toxicity characteristic if neutralization to pH 3.5 precipitates sufficient metals that the phosphogypsum slurry falling on the phosphogypsum stack no longer exhibits the toxicity characteristic. (N-TFI 15:54-56)

Response:

EPA agrees that some metals may not precipitate at pH 3.5. If the water is EP toxic or TC toxic, additional treatment, retrofitting, or removal of high metal concentrations would be required.

6.2 Compliance of Subtitle C Compliance Alternatives for Cooling Water with Subtitle C Requirements

- EPA's Subtitle C compliance alternatives for cooling water would not meet Subtitle C regulatory requirements for many of the same reasons discussed in connection with phosphogypsum. (N-TFI 15:58-59)

  - Because the existing cooling ponds will continue to receive corrosive and/or toxic cooling water after the effective date of Subtitle C regulation, the existing ponds will have to be closed pursuant to Subtitle C at the end of their useful life. (N-TFI 15:58-59)

  - The existing ponds will have to be closed pursuant to Subtitle C and replaced prior to the end of their useful life as a result of either the Subtitle C closure standards, the requirements of Section 3005(j) of RCRA, or under corrective action requirements. (N-TFI 15:58-59)

Response:

EPA disagrees, for many of the reasons discussed above. Cooling ponds would not necessarily receive corrosive wastes after the effective date, because the commenter is incorrect in asserting that this effective date would be six months from today's notice. Existing ponds that continued to

receive EP or TC toxic wastes following the effective date would, however, need to be retrofitted with liners.

- Provisions for metal treatment and the management of toxic treatment sludge must be included in the compliance alternatives for the management of cooling water at facilities where cooling water exhibits the toxicity characteristic of hazardous waste. (N-TFI 15:58-59)

Response:

EPA agrees that metal treatment and toxic treatment sludge management might be required for the management of cooling water that exhibits the toxicity characteristic.

6.3 Compliance of Subtitle C Alternatives with Other Subtitle C Requirements

- EPA's Subtitle C compliance alternatives will not meet other requirements of the Subtitle C regulatory program, which have been ignored by EPA. EPA has not evaluated the feasibility, cost, or economic impact of all aspects of the Subtitle C program as they may apply to one or more phosphate rock processing facilities on a site-specific basis. For example, differentiation has not been performed for facilities in the 100-year floodplain. (N-TFI 15:59-60)

Response:

In the RTC, EPA considered most aspects of the Subtitle C regulatory program on a site-specific basis, including information regarding floodplains at all facilities. The information presented in the Supplemental Analysis was limited to a model plant approach, for reasons discussed above.

6.4 Management of Lime Treatment Sludge in Unlined Impoundments

- Management of cooling water lime treatment sludge in unlined impoundments would not meet existing Subtitle D standards in Florida. (N-TFI 15:60)

Response:

EPA agrees that in the case of Florida, management of cooling water lime treatment sludge in unlined impoundments would probably not meet existing Subtitle D standards, because of the high concentrations of sodium and sulfate likely to be present in the treated effluent.

- EPA must consider the cost of lining ponds that would have to be installed under Subtitle C. The Louisiana solid waste regulations now proposed for comment require liners for such ponds as ponds for sludge from the neutralization of cooling water. (N-ARC 9:8)

Response:

EPA acknowledges that the overall costs of implementing certain of the engineering alternatives considered in the Supplemental Analysis would be greater than those reported because no costs associated with lining of new ponds were included.

6.5 Compliance of Subtitle C Alternatives with the Clean Water Act

- EPA's Subtitle C compliance Alternatives will not achieve compliance with the Clean Water Act (CWA), which requires that water management facilities be designed and constructed to accommodate a 25-year storm without discharge. These requirements do not appear to have been

taken into consideration. Furthermore, all of EPA's Subtitle C compliance Alternatives would have effects on the current water balance of phosphate rock processing facilities leading to increased treatment and discharge of process wastewater. (N-TFI 15:60-61)

Response:

The Agency acknowledges that implementation of these standards may have great impact on in-plant water use, but this is unsubstantiated. EPA believes that it is within each facility's ability to alter the management of their water balance in order to remain in compliance with the Clean Water Act.

6.6 Management of Phosphogypsum and Process Wastewater in Lined Units

- Lined waste management units designed to meet Subtitle C standards are not necessary to adequately protect the environment. (N-JRS 12:4)

Response:

EPA agrees that Subtitle C style waste management units may be more than necessary to achieve compliance with 3004(x) standards for special wastes, as reflected in the Subtitle C-Minus and D-Plus scenarios examined in the RTC and Supplemental Analysis.

- Impermeable liners will prevent the loss of all wastes, not merely treated hazardous wastes. For example, many sites have measurable increases in total dissolved solids, calcium, sulfate, and sodium near the cooling ponds and gypsum stacks. These parameters are not regulated under Subtitle C, but will be regulated by the states to assure compliance with primary and secondary drinking water standards. Utilization of lined waste management units consequently accomplishes two purposes; namely, control of hazardous and of non-hazardous characteristics. (N-JRS 12:4)

Response:

EPA agrees that impermeable liners will minimize or prevent the loss of contained wastes, both hazardous and non-hazardous.

- EPA should carefully consider the environmental effects of new gypsum stacks constructed with liners that do not meet the Subtitle C requirements. The two facilities described in the Supplemental Analysis will have a very small environmental impact; however if Subtitle C is adopted, facilities of this type would not be allowed. (N-JRS 12:4)

Response:

The commenter is correct in assuming that under a full Subtitle C scenario, the liner configurations referred to would not be allowed. However, because EPA has decided to not regulate these wastes under any type of Subtitle C program, this point is moot.

- The assumption that treated gypsum slurry and cooling water can be managed in compliance with RCRA regulations in an unlined stack or unlined pond is not valid. State regulations are forcing companies to install liners underneath the stack or pond for solid waste and groundwater protection purposes. For this reason, EPA has underestimated the cost of complying with Alternatives 1, 2, 4, 6, and 7. (N-JRS 12:4)

Response:

To EPA's knowledge, there are a small number of states requiring management of untreated and treated wastes in lined units; however, certain states, such as Florida, are moving in this direction. In addition, to the extent that regulations exist with respect to ground-water protection, EPA agrees that some of the cost elements under some Alternatives are incorrect. To the extent that existing or new regulations require management of phosphoric acid in lined units, baseline costs would be higher than those presented in the RTC and Supplemental Analysis . In such cases, therefore, the incremental cost of the Subtitle D-Plus and C-Minus scenarios will have been overestimated.

- Alternatives involving the use of HDPE liners, while costly, may not address the long term effects of leachate on ground water. If leachate from the phosphogypsum stack is not drained at the liner interface, corrosive acids could collect in this area and accelerate the deterioration of the liner. Upon failure of the liner, large volumes of concentrated acid would be released to groundwater. On the other hand, a HDPE liner overlying a clay liner would offer a secondary barrier to contamination. (N-DOI L1:2)

Response:

EPA agrees that use of HDPE liners in combination with a clay bottom liner offers increased protection over that of a synthetic liner system alone. The Agency also agrees that the best way to design lined management units is to incorporate leachate collection systems to reduce hydraulic head and contact of acidic leachate with liner materials. For impoundments containing solids, the Agency has, in its analyses, modeled use of a leachate collection system to remove any acid at the liner interface. For impoundments comprised mainly of liquids, on the other hand, it would be difficult to eliminate contact between acid and the liner interface, and thus, no leachate collection system would be used.

7.0 FEASIBILITY OF ALTERNATIVE WASTE MANAGEMENT PRACTICES

- The EPA Supplemental Analysis does not clearly define "engineering feasibility" for the alternative waste management practices. Consequently, the feasibility of the alternatives from an engineering, technical, and regulatory standpoint is addressed. Aside from the feasibility of the model plant developed by EPA, site-specific feasibility issues must also be addressed. (N-TFI 15:61-63)

Response:

EPA acknowledges the issues addressed in this comment. However, given time constraints, the intention of the EPA Supplemental Analysis was not to address site-specific feasibility issues. The model plant procedure attempts to encompass as many issues as possible. Certain site-specific issues are being addressed in the document entitled Technical Background Document : Data and Analyses in Support of the Regulatory Determination for Special Wastes from Phosphoric Acid Production.

- The requirement for a large amount of additional land, the cost of state compliance on operating and construction of new gypsum and cooling facilities, and the necessary discharge of excess water in accordance with Clean Water Act guidelines make this proposal impractical and uneconomical. It is not technically or economically feasible to comply with this requirement. (N-AGR 11:4)

Response:

EPA does not agree with the commenter regarding technical or economic feasibility. The Agency believes that the availability and cost of land needed for regulatory compliance are not critical issues. The incremental costs of managing the phosphoric acid wastes in this manner would be modest because the wastes are already piped considerable distances at some plants. Therefore, the Agency believes that "extending the pipeline," even for several miles, is not a significant issue, from either a feasibility or cost standpoint. EPA recognizes that implementation of these alternatives would create changes in the plant-level water balance. However, it has not been demonstrated to the Agency that internal water balance would be altered in such a way as to violate effluent guidelines. The commenter's concern with the cost of state compliance cannot be addressed without reference to specific cost items.

7.1 Feasibility of Separate Management of Gypsum Slurry and Cooling Water

- All of EPA's Subtitle C compliance Alternatives contemplate the separate management of phosphogypsum slurry and cooling water. However, the feasibility and cost of effecting this separation at existing phosphate rock processing plants are not addressed adequately. (N-GRD 8:2)(N-TFI 15:63-67)(N-SEM 4:1-2)(N-AGR 11:3)(N-IMC 6:2-3)(N-OCC 5:6-7)(N-AGR 7:2)

  - All existing facilities employ an integrated management system of gypsum slurry and cooling water. Thus, a segregated system is not a demonstrated technology. EPA has not considered the potential feasibility of such a system, especially its effect on plant water balance. IMC Fertilizer, New Wales, ran the water balance computer model under the conditions postulated in Alternatives 1 and 7. The results are enclosed as Attachment 2. The proven increased discharges raise serious issues of regulatory feasibility. They are contrary to the basis and objectives of the Clean Water Act and NPDES program requirements. The record does not indicate that EPA has recognized or considered these issues. (N-TFI 15:63-67)

  - An integrated system is essential to maintaining the required water balance. Separation of the gypsum slurry and cooling water circuits could lead to treatment and discharge of excess water and violation of applicable Clean Water Act effluent standards. The methodology for management of segregated circuits has not been shown to be feasible in

the past, and the EPA Supplemental Analysis does not address any methods that could be used for the separation of waters in an existing system. At a minimum, such a system would require the construction of a totally new and separate cooling pond and an expanded or new gypsum stack. (N-SEM 4:1-2)(N-AGR 11:3)

Site-Specific Implications of Separate Management

- Although the Faustina plant was designed with two separate pond systems, it was deemed necessary to commingle gypsum water with cooling water to maintain the proper water balance. It was confirmed that a totally separate management system decreased production throughout because the higher temperature water from the cooling pond increased filtration rates. (N-AGR 7:2)

- Contrary to EPA's assumptions regarding Engineering Alternative 1, a minimum of two ponds would be required on top of the stack. The New Wales facility, in order to minimize downtime, would require three ponds and 750 additional acres. (N-IMC 6:3)

- Engineering Alternative 1 would require a partition dam and a larger cooling pond to achieve adequate cooling and additional rainfall surge for gypsum stack run-off. (N-IMC 6:2)

- Hydraulic separation of existing cooling ponds from the gypsum stack system has many negative operating aspects. For example, the cooling pond provides surge for rainfall events. Separation requires that surge (now available to the connected gypsum circuit) will need to be provided depending on the existing plant configuration. Occidental has three gypsum stacks that would require a total of $63,000,000 in capital improvements. No costs were provided for this separation in the Supplemental Information Analysis. It appears that the estimates were inconsistently based on either new or existing plants depending on the item addressed. (N-OCC 5:6-7)

Response:

The commenters have based their arguments upon a misunderstanding of EPA's Supplemental Analysis. EPA believes that the importance of segregating the gypsum slurry and cooling water has been overstated by commenters. In no case did EPA state that a complete hydraulic separation, preventing co-mingling of water between the different management units and cooling ponds through any pathways, including ground water, would be either necessary or appropriate, even under a full Subtitle C scenario.

Feasibility of Separate Management, According to the Supplemental Analysis

- In the RTC, the Agency considered the costs associated with Subtitle C regulation for both process wastewaters and phosphogypsum. Rather than considering the wastes individually, the Agency presumed the necessity of considering the wastes together. The December 1990 analysis disproves the myth that these wastes must be commingled and co-managed. (N-NAS/EDF 17:3-4)

- The RTC assumed all the process wastewaters at every facility would be hazardous if the exemption from regulation was lifted. The Agency based this assumption on the necessary commingling and co-managing of all wastewaters at every facility. However, the December 1990 analysis identifies the particular wastewaters that are hazardous and describes techniques for avoiding such commingling. This strongly contradicts the cost assumptions upon which EPA relied in the RTC as justification for not regulating phosphoric acid production wastes as hazardous. (N-NAS/EDF 17:3)

- In fact, there are substantial waste minimization/pollution prevention opportunities associated with managing the wastes separately. According to EPA, the risks to human health and the environment posed by phosphogypsum would be greatly diminished if the waste was not exposed to the process wastewaters. (N-NAS/EDF 17:4)

Response:

The commenter is correct insofar as separate management of the two special wastes is feasible. The commenter is incorrect, however, in suggesting (as EPA did originally) that by limiting contact with acidic process wastewater, facilities could greatly reduce the entrainment of metallic contaminants from the gypsum into the process wastewater. The Agency now believes that the source of most of these contaminants is the entrained raw product acid remaining with the gypsum following the filtration operation. EPA believes that because both the gypsum and the process wastewater contribute significantly to the hazards (both potential and actual) described in the RTC, it is most appropriate for the Agency to develop its regulatory approach for these wastes in combination. Moreover, from a practical standpoint, waste management controls must address both wastes and other operational considerations in an integrated fashion if they are to be workable at the individual plant level. (This latter point is discussed in greater detail elsewhere in this document.)

7.2 Feasibility of Lime Neutralization

- Although neutralization of water used at phosphate rock processing plants prior to discharge pursuant to an NPDES permit has been demonstrated as the EPA Supplemental Analysis points out, the neutralization of all water generated and its reuse in the production process has never been demonstrated successfully on any scale at an existing phosphate rock processing plant. Therefore, by definition, it is not technically feasible. EPA's suggested neutralization scheme is fraught with difficulties that render it infeasible. Addition of lime to pH 7 was used in one plant but was abandoned due to problems, including excessive scaling. In the absence of empirical data, the operational effects of neutralization cannot be quantified. In addition, EPA's overall neutralization scheme is not feasible because the vast majority of existing phosphate rock processing facilities do not have the land required to implement the neutralization scheme. (N-SEM 4:2)(N-TFI 15:67-69)(N-TFI/JAC 15:17)

Response:

EPA's Regulatory Determination does not require that lime treatment be feasible because other available management alternatives clearly are feasible. EPA believes that resolution of the feasibility of lime neutralization would require substantial additional research.

- Three neutralization tests were conducted using phosphogypsum slurry, FSA, and process water. In all three incidents, chromium was tied up by neutralizing to a pH of 3.5. (N-CHEV 13:9)

Response:

The Agency acknowledges receipt of this information. Because, however, the Agency has not relied upon the engineering alternatives involving lime treatment in developing today's Regulatory Determination, resolution of this issue is not important in the current context.

- Lime neutralization reduces the amount of recoverable phosphoric acid and would require use of additional sulfuric acid to lower pH for reuse in plant. (N-SEM 4:3)

Response:

EPA agrees with the commenter that lime neutralization might reduce the amount of recoverable phosphoric acid from the process wastewater cooling pond though this is highly uncertain. EPA reminds the commenter that it did consider in its cost estimates both the cost of additional sulfuric acid required to buffer the effects of lime treatment of process wastewater recycled to the reactor, and the loss in production that would result from the use of lime treatment.

- EPA's assumption that treated process wastewater (pH of 3.5) will not exhibit any hazardous waste characteristics is incorrect. The characteristics of phosphate ores vary. While process wastewater for some ores may not exhibit hazardous characteristics at a pH ranging from 3.5 to 4.0 based on the new TCLP, other "treated" phosphate process wastewater may need to be increased to a pH of 8 in order to eliminate any hazardous characteristics under the TCLP. This would require the installation of a double-stage liming system, with two settling ponds. The capital costs for this system would be approximately $4,000,000 to $7,000,000. If any by-product or excess material is also TCLP-toxic, the double-stage liming facility could require a RCRA Subtitle C permit that meets RCRA TSDF standards. The need for a permit could more than triple costs. (N-TEX 10:7-8)

Response:

EPA agrees that lime treatment to pH 3.5 will not necessarily remove the hazardous characteristics of toxicity form process wastewater, where present. Facilities having EP or TC toxic wastewater would probably find the utilization of lined waste management units more cost-effective than lime treatment, as indicated in the above comment.

- Lime sludges generated from the first stage treatment of process water tend to remain very wet and soft and generally do not dry sufficiently to develop adequate bearing capacity to support construction equipment. Therefore, capping the lime sludge ponds after facility closure will be extremely difficult and expensive, if at all possible. (N-TFI/AA 15:6)

Response:

EPA acknowledges receipt of this information and has determined that the commenter may be correct; in fact, EPA acknowledged in the December 1990 Supplemental Analysis (p. 27) that "the characteristics of CaF_2 sludge, which is 70 to 80 percent water and has a very fine-grained consistency, may limit the degree to which settling would occur in the impoundment." However, there is no definitive factual evidence to affirm this statement. EPA further acknowledges the potential difficulty and expense of capping the ponds but argues that insufficient evidence exists to demonstrate that lime neutralization will reduce the amount of recoverable phosphoric acid from the process wastewater cooling pond. EPA reminds the commenter that it did consider in its cost estimates both the cost of additional sulfuric acid required to buffer the effects of lime treatment of process wastewater recycled to the reactor, and the loss in production that would result from the use of lime treatment.

<u>Scaling as a Result of Neutralization</u>

- Lime neutralization causes scaling of gypsum lines and drain lines (N-SEM 4:3)(N-CHEV 13:3)

  - The lime neutralization system at Chevron has never been operated because laboratory and pilot scale tests indicate that its operation may not be technically feasible and because of economic and environmental considerations. Scaling would occur in plant equipment that comes in contact with lime treated process water that results in increased downtime and increased P_2O_5 losses. As described in Chevron's comments on the RTC, laboratory

and pilot equipment used in experiments were severely scaled and required acid washing. (N-CHEV 13:3)

Response:

EPA acknowledges receipt of this information. In the December 1990 Supplemental Analysis, EPA accounted for additional operating and maintenance costs resulting from loss in production due to downtime associated with cleaning of additional scaling of process equipment that would handle lime-treated process wastewater returned to the model plant. EPA based its analysis and estimation of these additional costs on information provided by an operating phosphoric acid facility. This information suggests that phosphoric acid production could be reduced by ten percent due to the downtime associated with scale removal. (Supplemental Analysis, page 14). EPA acknowledges that its application of this factor to its model plant is only a rough estimate of downtime. However, the Agency points out that the actual amount of scale that would form under each Engineering Alternative and the associated downtime and cleaning necessary to handle it are difficult to quantify without operating data.

Silica Formation as a Result of Neutralization

- Commenters stated that a colloidal silica gel would be created during the neutralization of process wastewater and phosphogypsum. (N-AGR 7:2)(N-CHEV 13:3-4)(N-JRS 12:3)

  - EPA's evaluation of the removal of fluoride using lime is correct; however, the amount of lime required to reach a pH of 3.5 cannot be determined without conducting experiments of typical water. A solution having a pH of 3.5 can be hazardous if the corrosion rate is equal to or greater than 0.25 inches per year on mild steel. EPA has failed to recognize that the fluoride compounds that are in solution also exist in equilibrium with sodium, magnesium, and potassium fluosilicates that precipitate. When calcium is added to the system, it will react to form calcium fluoride precipitates that will alter the equilibrium and then release silica plus the metallic ion (sodium, magnesium, or potassium). Furthermore, the silica solid that forms does so with water of hydration forming a gelatinous material. The silica will hydrate large quantities of water if the reaction occurs at a low temperature. Silica may hydrate up to ten moles of water for each mole of SiO_2. The resulting compound becomes a gelatinous material with a very low solids content that is very difficult to de-water and generates enormous sludge volumes. (N-JRS 12:3)

  - Chevron's RTC comments addressed the formation of silica gel. In its comments, Chevron provided a figure (not included in this summary) showing the effect of gel content on filtration rates of several effluent samples and comparing soluble silica levels against solution pH. Even minute quantities of gel present in the filter wash water will lead to large reductions in filtration rates. Any breaking up of once formed gel globules will further decrease filter wash performance. In experiments attempting to stabilize the limed effluent, pH was adjusted to around 2.0 where silicic acid is known to be stable, but gelling occurred in each case. In a second reaction stage, the pH was adjusted up to the range from 9-10. Gelling also occurred with this treatment. There was no discernable relation between soluble silica level and tendency to gel. (N-CHEV 13:3-4)

  - A paper in Industrial and Engineering Chemistry Product Research and Development, Volume 19, January 1980, page 253, reporting on plant experience in testing a patented process for recovering fluorspar from pond water, explained that pond water limed to a pH above 2 always gelled and required re-acidification to get acceptable silica separation before it could be returned to the pond, thus negating the supposed advantage of lime treatment. (N-AGR 7:2)

Response:

EPA is not convinced that the catastrophic operational effects predicted by the commenters would occur on a widespread and continuing basis if lime treatment of the special wastes were to be instituted, particularly if FSA recovery were to be practiced. The appropriate question is whether lime treatment of process wastewater that has not reached a high equilibrium concentration of chemical contaminants would result in significant gel formation, not whether lime treatment of currently generated "pond water" would create such operational problems. Nevertheless, EPA does have some concerns about the efficacy of a lime treatment strategy.

7.2.1 Feasibility of Lime Slaking With Cooling Water

- Lime slaking with acidic cooling water is not technically feasible. When lime is slaked with acidic cooling water, reactions begin to occur immediately, resulting in a caking and coating of the lime, making the lime inefficient to achieve neutralization and infeasible to handle. The results would be similar when attempting to slake lime with the proportion of acidic cooling water postulated in Alternative 1. Consequently, Alternative 1 would require that up to 1,404 tons per day of fresh slaking water be added to the water management system, further exacerbating water balance problems. Moreover, it is highly unlikely that the necessary authorizations could be obtained to withdraw over 1,000 tons per day of fresh groundwater necessary for lime slaking. (N-TFI 15:69-70)

Response:

EPA recognizes that during the initial compliance period industry would probably need to increase their fresh water intake for lime slaking. Over time, the pH of recycled process wastewater from the cooling pond should increase to 3.5 due to lime neutralization, which would greatly reduce the technical problems noted. Therefore, the potential problem stated by commenters is likely to be of relatively short duration. In any case, the Agency has not relied on a full Subtitle C scenario in developing today's Regulatory Determination, and, therefore, facility operators would not necessarily have to undertake lime neutralization to achieve regulatory compliance.

7.2.2 Feasibility of Neutralization of Gypsum Slurry

- The technological feasibility of the treatment of gypsum slurry by adding lime slurry to the gypsum pump tanks has not been proven, and there is evidence that sufficient scaling to plug the slurry lines would occur almost immediately. (N-IMC 6:3)(N-TFI/AA 15:7-11)

  - Data presented shows the results of settling tests and permeability tests, sediment to the gypsum stack, and sediment quantities from first stage liming station with predicted sediment from neutralization of FSA in cooling water. (N-TFI/AA 15:7-11)

Response:

EPA acknowledges receipt of this information. There is no compelling evidence suggesting that the lines carrying gypsum slurry would plug immediately. EPA recognizes that this is a significant issue; however, resolution of this question awaits additional information from both laboratory and field studies. Such information would not, in any case, affect today's Regulatory Determination.

7.2.2.1 Feasibility of Management of Treated Slurry in Stacks

- Management of the phosphogypsum/lime slurry mixture in stacks is an undemonstrated technology and EP[illegible] no effort to analyze the technical feasibility of this management technique. (N-

ARC 9:9-10)(N-AGR 7:2)(N-JRS 12:6)(N-TFI 15:71-73)(N-TFI/AA 15:1-6)(N-SEM 4:3)(N-IMC 6:2)(N-CHEV 13:4)(N-TEX 10:5)

- Because low pH is necessary for rapid hydration to yield gypsum with good stacking qualities, it is uncertain whether or not hydrated hemi-hydrate, neutralized to a pH of 3.5, would have adequate stacking properties. If it did not, facilities would have to develop a procedure for stacking gypsum that does not stack well. It is uncertain whether such a procedure could be developed for the gypsum and what its cost would be, although it would be significant. In addition to cost and purely operational considerations, gypsum with poor stacking qualities could result in an unstable stack that could pose unacceptable worker safety risk and environmental risk. (N-ARC 9:9-10)

- In tests, lime-treated gypsum slurry, once settled, retained from 50 percent to 100 percent more water than regular phosphogypsum. This would have major impacts on stackability and land required since it would increase the amount of waste material to be managed. (N-AGR 7:2)(N-JRS 12:6)

- Permeability tests performed by Ardaman showed that neutralized phosphogypsum slurry is 133 times less pervious than phosphogypsum and that the lime slurry is 1,000 times less pervious than phosphogypsum. As a result, drainage of neutralized phosphogypsum slurry would be significantly lower than that of conventional phosphogypsum. Because of this reduced drainage, the neutralized phosphogypsum slurry could not be managed in stacks but would need to be managed in impoundments of some type. The RTC analysis provides no indication of the large size of the impoundments necessary to manage phosphogypsum, much less the phosphogypsum/lime slurry contemplated by EPA's compliance Alternatives. The inability to manage neutralized phosphogypsum slurry in stacks would make it impossible to implement any of the Subtitle C compliance Alternatives suggested in the EPA Supplemental Analysis. (N-TFI 15:71-73)(N-TFI/AA 15:6)

- The sludge produced by the first stage of the lime treatment process is much finer than the gypsum waste. The sludge generated by the lime treatment of excess cooling water should therefore not be pumped to the gypsum stack. There is no actual field experience available within the phosphate industry to draw from in evaluating this concept. A 3-page detailed description of the laboratory program, including sample identification, sample preparation, settling tests, and permeability tests is given, as is a 3-page description of the engineering analyses including estimated sludge storage area, and cost estimates for a lined storage pond as required by Florida regulations. (N-TFI/AA 15:1-5)

- EPA's assumption that existing phosphogypsum slurry (pH 1.5) and the proposed "treated" slurry (pH 3.5) exhibit the same material handling characteristics is not correct. Lime particles from the liming process are so minute that when stirred in a beaker they never settle out. This practice could potentially plug water transport through the stack. Stacks composed of a slurry of lime, gypsum, and process water may not be stable due to the formation of gelatinous silica that could seal off water percolation and cause sloughing. This instability would require lesser stack slopes and reduced stack height and would shorten the life of the stack. Hydraulic pressure against stack walls could cause failure of side walls. (N-SEM 4:3)(N-IMC 6:2)(N-CHEV 13:4)(N-TEX 10:5)

Response:

EPA finds the commenters' laboratory results interesting but does not believe that they directly address the issue at hand. The comments refer to the neutralization of gypsum mixed with

wastewater rather than the neutralization of the gypsum alone. Additionally, as stated above, EPA does not believe that this issue is directly related to today's Regulatory Determination.

7.2.2.2 Feasibility of Recycling Treated Slurry Transport Water

- Recycling of neutralized phosphogypsum slurry transport water could make the operation of a phosphoric acid plant technically infeasible. (N-ARC 9:11-12)(N-TFI 15:73-74)

  - The neutralization of phosphoric acid process wastewater results in the formation of a gel. The colloidal nature of the gel and the lengthy settling times observed in the lab, combined with the limited retention time proposed by the EPA model plan scenario, make it likely that the gel will remain suspended in the process water return. This suspension of gel could lead to detrimental consequences to the plant process and equipment. Perhaps the most significant consequence is the potential effect on filtration. When recycled slurry transport water is used as filter washwater, entrained silica gel will collect on the filters rapidly binding them. There is no technology for removing the fine gel from the filters. The build-up of gel could make it infeasible to continue to operate the facility. (N-TFI 15:73-74)

  - If the gypsum slurry is neutralized to a pH of 3.5, fluoride will precipitate as calcium fluoride and sodium and silica concentrations in the pond water will build up to high levels. These large concentrations of sodium in the pond water may precipitate sodium silicofluoride so fast that most of the crystals will be small. In this case, scaling and blinding of the filter would result. In addition, silica may build up in the pond water, at levels too high for the silica to react with all of the fluorides, causing blinding of the filter and the formation of scale in the equipment. Arcadian has observed this silica gel formation phenomenon accompanying lime neutralization of pond water in a number of laboratory tests. The combination of silica gel and sodium silicofluoride formation may prove to be the most costly effect of liming gypsum slurry. (N-ARC 9:11-12)

Response:

The commenters have based this analysis on their incorrect assumption that they would be using existing process wastewater to neutralize the slurry. Initially, industry would need to use fresh water to avoid the problems mentioned by the commenters. It is unclear, however, whether the predicted effects would occur over the long-term as the pH of recycled process wastewater increased to 3.5 through lime neutralization.

7.2.2.3 Effects of Management of Treated Slurry on Management of Gypsum in Lined Stacks

- The management of neutralized phosphogypsum slurry would have a significant negative effect on the management of phosphogypsum in lined stacks. Ardaman notes that new phosphogypsum stacks designed with synthetic bottom liners generally have perimeter underdrains to improve stack stability. The silica gel generated as a result of neutralization will surely cement and seal the underdrains. As a result, seepage gradients on the stack slopes will increase, requiring that the stack have a flatter slope. Stack areas would increase, increasing the area of the contaminated watershed. EPA must consider the effect of the construction and operation of new phosphogypsum stacks on the feasibility of neutralization of phosphogypsum slurry. (N-TFI 15:74-75)(N-TFI/A [illegible]:6)

Response:

See response immediately above.

7.2.2.4 Feasibility of Fifty Additional Acres Atop Gypsum Stack

- Providing 50 acres of extra settling area on top of the model plant phosphogypsum stack is not feasible. Implementation of any of the Subtitle C Alternatives requires the addition of settling area on the stack to manage lime slurry. This solution ignores the fact that the model plant has a total of 50 acres settling area on top of the stack. Clearly, it would be impossible to add an additional 50 acres to an already existing total of 50 acres. At the model plant, the required settling area could only be provided by immediately beginning a new stack. The vast majority of facilities surveyed by TFI report that they do not have the space at the top of their stacks to provide the extra settling area and would thus have to install new stacks. (N-TFI 15:75-77)

Response:

The Agency believes that the volume provided by an additional pond need not be limited by surface area. Increasing the depth of the pond can also expand the volume of the pond.

7.3 Feasibility of Operation of Cooling Water Circuit Using Neutralized Water

- Operation of the plant cooling water circuit using neutralized cooling water as contemplated by Compliance Alternatives 1 and 2 is infeasible. All experiments conducted to date with the neutralization of phosphoric acid process wastewater indicate that neutralization to pH 3.5 produces a colloidal silica gel, that settles extremely slowly, if at all. Laboratory test results indicate that clarification of the return water will probably not be achieved on top of the stack. As a result, recirculation of neutralized cooling water containing silica gel will lead to gel build-up throughout the cooling and fluorine scrubber water circuits. TFI is unaware of a technology for the removal of this colloidal gel. The build-up of gel would make it infeasible to continue to operate the facility. (N-TFI 15:77-78)(N-TFI/AA 15:6)

Response:

EPA is not convinced that the catastrophic operational effects predicted by the commenters would occur on a widespread and continuing basis if lime treatment of the special wastes were to be instituted, particularly if FSA recovery were to be practiced. The appropriate question is whether lime treatment of process wastewater that has not reached a high equilibrium concentration of chemical contaminants would result in significant gel formation, not whether lime treatment of currently generated "pond water" would create such operational problems. Nevertheless, EPA does have some concerns about the efficacy of a lime treatment strategy.

7.4 Feasibility of Hydrofluosilicic Acid Recovery as Subtitle C Alternative

- FSA Recovery will create waste management problems making it technically infeasible. (N-TFI/JAC 15:20-21)(N-TFI/JAC 15:40)(N-IMC 6:4)

    - Fluoride recovery from the flash cooler and the reactor fume scrubber as assumed in Alternatives 2 and 7 is not practiced at present because no means has been found to reduce the P_2O_5 content of the fluosilicic acid sufficiently to make a marketable product. There are also difficulties associated with the formation of silica gel in such systems, causing loss of production. Generally, such systems will be dirty and difficult to operate. Furthermore, since the barometric condenser cooling water will now be the product of indirect cooling, it will be hotter than water from the cooling pond, increasing water flow

requirements and causing the phosphoric acid evaporators to run hotter. The effect of this on the rubber linings of vessels and pipes, on the corrosion of pumps, and on the scaling of heat exchangers and evaporator bodies cannot be quantified. It is not unreasonable to suggest a total reduction in plant utilization of at least 20 percent. (N-TFI/JAC 15:20-21)

- Engineering Alternative 2 combines Engineering Alternative 1 with FSA Recovery Facilities. All of the comments addressing Engineering Alternative 1 also apply to Engineering Alternative 2. (N-IMC 6:4)

- Double-stage recovery has inherent technical problems that have not been resolved. (N-IMC 6:4)

- Added to the site-specific concerns regarding installation of FSA recovery facilities under engineering Alternative 7 are more extensive modifications to the evaporators to allow for higher barometric condenser temperature. These modifications could add 1-2 months to the engineering and construction program. (N-TFI/JAC 15:40)

Response:

EPA acknowledges receipt of this information. In any case, the information submitted does not affect the outcome of today's Regulatory Determination for reasons stated above. In addition, the Agency believes more research is necessary to adequately address this issue.

7.5 Feasibility of Closed Circuit Cooling (Alternative 7)

- Closed loop cooling systems have been tried and do not work. It is improper to propose technology and related costs on systems that have not been successfully implemented. (N-OCC 5:3-4)(N-IMC 6:4)(N-TEX 10:11)(N-TFI 15:84-90)(N-SEM 4:3-4)

- The use of cooling towers and heat exchangers (as envisioned by Alternative 7) is not a demonstrated technology in the phosphoric acid industry and is therefore, by definition, technically infeasible. (N-TFI 15:84-90)(N-SEM 4:3-4)

- To overcome double approach temperature cooling loss with heat exchangers would be, at best, a mammoth undertaking requiring vast areas of heat exchanger surface, especially given climatic conditions in Florida and Louisiana. It is not clear that any size heat exchanger can overcome the double approach temperature cooling loss during periods of high air temperature and humidity. The use of heat exchangers may make it literally impossible to produce merchant grade and superphosphoric acid during certain times of the year. (N-TFI 15:84-90)

- Considering rainfall in Florida, a surge pond is required in both dry and wet weather for the gypsum stack rainfall catchment area. Typical size to avoid very expensive treatment and discharge is also a size sufficient for cooling. Therefore, the "cooling pond" could not be eliminated under Alternative 7. (N-OCC 5:3)

- To maintain existing Occidental plant water balances neutralization of water equivalent to that no longer exiting the pond by evaporation from process heat will be necessary, or the cost of additional technology needs to be added. Occidental estimated that treatment and discharge of 2 million gallons per day will be necessary to maintain surge volume equivalent to the drawdown the plants currently get from the direct heat load to the ponds under Alternative 7. Other foreseen problems affecting production rate are associated with scaling and corrosion on heat transfer surfaces, and approach temperature effects on

evaporation, i.e. existing evaporators may be undersized for non-contact cooling using cooling towers in Florida. (N-OCC 5:4)

- Engineering Alternative 7 combines EA 1 and EA 2 plus a closed loop cooling system. All of the comments on Alternatives 1 and 2 are incorporated by reference. (N-IMC 6:4)

- The EPA Supplemental Analysis and Alternative 7 are, at best, significantly flawed and must be rejected as a scheme for Subtitle C or D regulation. (N-TEX 10:11)

Response:

EPA believes that the statement that a closed loop cooling system is a technology that has not been successfully implemented is incorrect; sulfuric acid manufacturing plants at phosphoric acid facilities utilize cooling towers and heat exchangers, and the petrochemicals industry uses distillation towers and heat exchangers. Nonetheless, some engineering and operational challenges must be overcome before successful implementation of such a program in the phosphoric acid industry. More research would ultimately be necessary to adapt a closed loop cooling system to the phosphoric acid industry.

- Scaling will be a problem in a closed loop heat exchanger/cooling tower. (N-JRS 12:3-4)(N-TFI 15:84-90)

  - The closed loop heat exchanger/cooling tower system will corrode and scale on the contact side of the heat exchanger system. If side stream treatment or blowdown of the contact water is not utilized, the condensed vapors will continuously concentrate. Because there is entrainment carryover, there will also be sodium, magnesium, calcium and potassium that will cause fluosilicate salts to precipitate. Operation of the heat exchanger would be very difficult and probably would require installation of spare heat exchangers in order to provide adequate operating-factor reliability. (N-JRS 12:3-4)

  - EPA asserts that cooling tower scaling can be addressed by extra maintenance and its associated costs. The scaling problems associated with cooling towers would be magnified to an extraordinary degree by the scaling that would occur over hundreds of thousands of square feet of heat exchanger surface. Therefore, scaling is a matter of technical feasibility and not simply cost. (N-TFI 15:84-90)

Response:

EPA recognizes receipt of this information but cannot determine its validity. Regardless, the information does not affect today's Regulatory Determination.

7.6 Availability of Land to Implement Subtitle C Alternatives

- Some commenters contended that adequate amounts of land are unavailable to implement the Subtitle C compliance alternatives. Many of the facilities commented that they did not have enough land available to accommodate all of these units, and many of these facilities reported that they could not purchase adjacent property of sufficient size. (N-TFI 15:90-93)(N-AGR 11:3-4)(N-IMC 6:2-3)(N-JRS 12:5-7)(N-GRD 8:2)(N-OCC 5:2)(N-AGR 7:3)

Land at Specific Sites

- Land is not available to implement EPA's Subtitle C Compliance Alternatives. The implementation of these Alternatives would require that very significant amounts of land be employed. Under Alternative 1, additional land will be required for extra filtration capacity, landfilling sludge, retaining cooling water, new lime receiving and slaking facilities, a new phosphogypsum transport water pond, additional cooling ponds, and a new phosphogypsum stack. At existing phosphate rock processing facilities, the land demands for the small model plant would be magnified by as much as threefold or more. Virtually all of the facilities surveyed by TFI report that they do not have land available to implement Alternative 1. Most facilities report that such vast amounts of land are unavailable to them at any price. Similarly, a number of facilities report that land is unavailable to implement Alternatives 2 and 7. (N-TFI 15:90-93)

- Actual land areas required for the additional solid waste generated by these Alternatives are unavailable to Gardinier. (N-GRD 8:2)

- EPA assumes that the cooling pond neutralization sludge will go to an unlined pond of questionable size. The New Wales facility would require a sludge pond of 3,480 acres that would not be permitted by the State of Florida even if it were available. (N-IMC 6:3)

- Occidental has no rights on a major proportion of the land apparently required by the RTC and NODA scenarios and Alternatives. It is expected that this land will not be available for the use projected by EPA. (N-OCC 5:2)

- There is simply not enough suitable land available at SPCW for EPA's new land requirements. Over 1,300 acres of new area would be needed. (N-AGR 11:4)

- The ownership of Government-owned property (Indian Tribes, Forest Service, U.S. Bureau of Land Management) eliminates much of the land available for future gypsum stacks or cooling ponds. (N-JRS 12:5-6)

Appropriateness of Estimates of Land Required

- EPA's lime neutralization scenario would require over 640 acres (one square mile) of additional land for waste treatment facilities for the model plant. It will include 50 acres more on top of the stack to hold the new transport water, 50 acres of cooling pond, and 540 acres to store the neutralized process waste water sludge over the life of the model plant. (N-AGR 11:3)

- The leachate that does not exit into the toe drains will eventually seep into the groundwater. This leachate may force the installation of a liner under the gypsum to protect drinking water standards. The installation of a liner is not possible under an existing gypsum stack. Additional acreage would thus be required for a new gypsum stack. (N-JRS 12:7)

- The land availability and suitability are greatly oversimplified and consequently greatly underestimated. No dollar amount is currently available on this aspect of cost and in Simplot's case may not be available at any cost. (N-JRS 12:7)

Effects of Site-Specific Factors on Land Requirements

- Because of poorer soil bearing strength in Louisiana, phosphoric acid production requires more land for gypsum management than is required in Florida. EPA's Alternatives would

put Louisiana producers at an even greater disadvantage. As less stackable gypsum would result from lime treatment, providing a pond on the gypsum units would increase land requirements. When combined with the increased size of the gypsum units, regulations would reduce the economic life of the Louisiana plants. (N-AGR 7:3)

- In order to minimize downtime under Engineering Alternative 1, the New Wales facility would require three ponds and 750 additional acres. Additional acreage for gypsum storage would be required. (N-IMC 6:2-3)

Response:

EPA believes that the availability and cost of land needed for regulatory compliance are not critical issues. The Agency believes that the commenters' estimates of the additional amount of land necessary to meet today's regulatory determination are significantly overstated. Data supporting EPA's position are provided in the technical background document on phosphoric acid special wastes. Also, land could be acquired that was not adjacent to the facility, that is, the units could be sited at some distance from the plant. The incremental costs of managing the phosphoric acid wastes in this manner would be modest (in relation to other aspects of regulatory compliance) because the wastes are already piped considerable distances at some plants. Therefore, the Agency believes that "extending the pipeline," even for several miles, is not a significant issue, from either a feasibility or cost standpoint.

7.7 Feasibility of Maintaining Plant Water Balance Under Subtitle C Alternatives

- Commenters expressed concern over the technical difficulty inherent in separately managing phophogypsum and process wastewater so that no hydraulic communication between the two "circuits" is permitted. Because the integrated management of these two wastes is employed at all existing facilities and is, according to commenters, essential to maintaining a negative water balance (i.e., zero discharge through NPDES outfalls), commenters believe that the separate management of these two wastes is an undemonstrated technology that cannot be used to support a regulatory determination. (N-TFI 15:93-96)(N-TFI/JAC 15:32)(N-TFI/JAC 15:32-33)(N-ARC 9:6-8)(N-IMC 6:4-5)(N-IMC 6:7-14)(N-TFI/Att.2 15:1-4)

- Implementation of EPA's Subtitle C Compliance Alternatives would make it infeasible to maintain plant water balance. The separation of the currently integrated management system for phosphogypsum and cooling water, the addition of fresh water to the system for any reason (including as a result of lime slaking), and the installation of the cooling tower/heat exchanger system of Alternative 7 all will inevitably require that acidic water be treated and discharged, presenting significant issues of "regulatory feasibility." Existing phosphate rock processing complexes incorporate a number of other production facilities necessary to the processing of phosphate rock. No significant revision to operating practices can be undertaken at such facilities without a detailed review of the potential effects on the water balance of the whole complex, as opposed to the battery limits of the phosphoric acid plant alone. EPA must analyze the crucial water balance issues on a real world basis before concluding that any of its alternatives are feasible. (N-TFI 15:93-96)

  Discharge of Water from the Model Plant

- Plants in Florida are currently benefiting from low rainfall and, consequently, have no discharges. The water balance is, however, very close considering variations in rainfall and evaporation on a month-to-month basis and typical surge volumes. Discharges have, therefore, been necessary in the past. Consequently, the model plant must be either discharging some contaminated water, or is in such a balanced situation that any increase

in the net water input to the plant will be treated to the applicable standards and discharged. (N-TFI/JAC 15:32)

- The Process Flow Diagram for the base plant shows an evaporation of 2,633 tons per day from the contaminated water system. In Alternative 7, the same amount is evaporated from fresh water. The contaminated water is then cooled. The net result is that the contaminated water system lacks removal of 2,633 tons per day of water by evaporation in Alternative 7, when compared with the base plant. This water will have to be discharged, in addition to any water that is discharged from the model plant. The Process Flow Diagram for Alternative 7 also shows 252 tons per day of fresh water cooling tower blowdown being added to the process as lime slaking water. Also, 252 tons per day are shown leaving the system in recovered FSA. Assuming FSA is not recovered, 504 tons per day are added to the contaminated water requiring treatment and discharge. (N-TFI/JAC 15:32-33)

Site-Specific Factors

- The model plant approach does not adequately address site-specific factors involved in water balance maintenance, and in fact, the alternatives and analysis ignore the magnitude of the cost of wastewater management to facilities that do not have the fortunate water balance of the model plant. Achieving the water treatment capacity that would be required under the Subtitle C alternatives would be an enormous expense. Arcadian has already spent several million dollars to reduce the generation of excess water, and thus, Arcadian is not receptive to any proposal that would increase its fresh water intake for slaking lime or, as in Alternative 7, decrease evaporation of excess water by removing heat in a fresh water cooling tower. EPA must identify and consider these site specific water balance problems and costs prior to considering regulation of phosphoric acid plants under Subtitle C. (N-ARC 9:6-8)

Water Balance Test Results

- Engineering Alternatives 1, 2, and 7 would seriously affect plant water balances. [The New Wales facility is a zero-discharge facility and has no NPDES permit (IMC 6:4-5)]. The IMC computer program for plant water balance run on Alternatives 1 and 7 are attached and show a requirement to treat and discharge a significant amount of water. A computer program for plant water balance run was not performed for Alternative 2 since insufficient information is available for FSA treatment, but the results should be similar to Alternative 1. (N-IMC 6:4-5)(N-IMC 6:7-14)(N-TFI/Att.2 15:1-4)

Response:

EPA believes that the potential impacts on plant water balance and associated regulatory significance of the issue as suggested by the commenters are substantially overstated. EPA acknowledges that the present method of co-managing phosphogypsum and process wastewater allows many facilities to achieve a negative water balance and zero NPDES process wastewater discharge. The Agency believes, however, that these facilities have achieved this optimum situation through judicious decisions regarding water use and storage that have resulted from best engineering judgement; the Agency further believes that separate management of the two waste streams (without complete hydraulic separation) is not a complete obstacle to achieving optimum water balance if sufficient engineering judgement is applied.

8.0 COST ESTIMATES

- Cost data are incomplete, conflicting, speculative, and unsubstantiated. (N-TFI 15:96-97)(N-JRS 12:7)

  - The cost data provided in the EPA and Badger Reports are often incomplete and sometimes conflicting. Furthermore, in many instances, no analysis is provided to show how particular cost estimates were arrived at. (N-TFI 15:96-97)

  - All the alternatives need to be revised to more accurately project the cost of each alternative. (N-JRS 12:7)

Response:

EPA believes that a complete cost analysis has been performed and that the Supplemental Analysis adequately served its intended objectives. The Agency recognizes that, in some instances, documentation of certain cost components was incomplete.

- Because a model plant analysis was used, site-specific factors were not taken into account.

  - Site-specific factors will undoubtedly drive the cost of implementing the Subtitle C compliance alternatives considerably higher at existing phosphate rock processing facilities. (N-TFI:110-111)

  - Arcadian's process is deficient in metals common to the phosphoric acid wet process, and thus Arcadian must purchase mineral additives to supplement this deficiency. If Arcadian had to neutralize its gypsum slurry to a pH of 3.5, its process would be even more iron and aluminum deficient and it would have to purchase even more replacement mineral. EPA did not consider this consequence of slurry neutralization in its analysis for the Supplemental Analysis. (N-ARC 9:10-11)

Response:

The model plant approach is commonly utilized in cost analyses of this type. Given time constraints and the primary objective of soliciting comment on the general approaches to waste management described in the Supplemental Analysis, a site-specific cost analysis was both infeasible and inappropriate. EPA is aware that many site-specific considerations cannot be taken into account under a model plant approach and that these considerations would influence the actual facility-specific regulatory compliance costs. Furthermore, because EPA is not confident that full Subtitle C compliance is technically feasible for existing phosphoric acid plants, the cost and impact analysis conducted for today's notice (included in a document entitled Technical Background Document : Data and Analyses in Support of the Regulatory Determination for Special Wastes from Phosphoric Acid Production) focus exclusively on the Subtitle C-Minus and D-Plus scenarios.

- Many costs are clearly not reflected for the model plant as delineated in Appendix B-1. Minimal capital expenditures for new gypsum slurry "reactors," hydraulic separation, and sludge disposal impoundments will total $217,000,000 or, with escalation and contingency, $250,000,000. For a 1,000,000 TPY P_2O_5 complex, this translates into incremental fixed costs alone of over $60 per ton of P_2O_5 produced. Adjustment of Occidental's June 20, 1990 appraisal to EPA's new Alternative 1 will escalate incremental costs to at least a range of $107 to $127 per ton of P_2O_5 produced for fixed costs alone. (N-OCC 5:7-8)

Response:

In reference to the question of gypsum slurry reactors, it is possible that, due to the addition of lime to the material entering the gypsum slurry reactors, larger tanks would be necessary. However, EPA assumed that the existing gypsum slurry tanks would be used, thereby eliminating the need for additional capital expenditures. Further analysis would be necessary to provide a definitive answer to this question. Regarding hydraulic separation, the Agency has never stated that it would require complete hydraulic separation of the areas dedicated to gypsum disposal and process water cooling. Accordingly, EPA does not believe that a plant retrofit to achieve separation of these areas would be necessary or required. Regarding sludge disposal impoundments, EPA estimated costs for a sludge disposal impoundment designed to accommodate a 15-year accumulation of process wastewater treatment sludge. To the extent that such impoundments may require liners (e.g., in the State of Florida), EPA has underestimated the associated compliance costs.

- The cost estimates for the phosphogypsum management scheme proposed in the three Subtitle C Alternatives (i.e., Alternatives 1, 2, and 7) include no costs for the closure or post-closure care of the existing phosphogypsum stack. This seems to suggest that, under the Subtitle C scenario, the stack is simply to be abandoned at the end of its useful life. This phosphogypsum management scheme is not efficacious to comply with Subtitle C requirements for a number of reasons. (N-TFI 15:41)

Response:

Because EPA has not historically imposed Subtitle C regulation retroactively, facility operators would not be required to undertake Subtitle C closure activities for stacks not active as of the effective date. The Agency assumes that, as of the effective date, existing stacks would no longer be used for gypsum disposal.

8.1 Operating Year of Existing Phosphoric Acid Facilities

- EPA has overstated the operating year of existing phosphoric acid production facilities.
  - Because of required periodic and annual maintenance, phosphoric acid production facilities do not operate more than 330 days per year, on average, as opposed to the 365-day year assumed in the Supplemental Analysis. Therefore, EPA has significantly understated the incremental costs per ton. (N-TFI 15:97-98)(N-JRS 12:7)
  - Using the proper production year of 330 days, the incremental cost per ton should be: $48.74 per ton for Alternative 1; $41.17 per ton for Alternative 2; and $49.74 per ton for Alternative 7. Even on the basis of an erroneous 365-day operating year, the incremental costs per ton for Alternatives 2 and 7 appear to have been miscalculated and would be $37.22 for Alternative 2 and $44.96 for Alternative 7. (N-TFI 15:97-98)

Response:

Data submitted by individual facility operators in EPA's 1989 National Survey of Special Wastes from Mineral Processing Facilities demonstrate that most phosphoric acid plants operated for more than 350 days in 1988. Nonetheless, EPA recognizes that individual production lines within a given plant may be subject to considerable down time for maintenance and repairs. Because the model plant used to evaluate the engineering alternatives in the Supplemental Analysis was based on a single production line, the Agency has revised its cost estimates to reflect the commenter's suggestion that a 330-day operating year be employed. The results of this revision are presented in the Technical Background Document.

8.2 Accuracy of Estimate of Costs of Managing Lime Treatment Sludge

- The costs of managing lime treatment sludge were underestimated because capital costs, including land requirements, were underestimated; closure costs were not considered; and operating and maintenance costs were ignored. (N-TFI 15:98-99)(N-TFI/AA 15:6,44)(N-SEM 4:2-3)(N-OCC 5:7-8)(N-IMC 6:2)(N-AGR 11:3)(N-JRS 12:3,7)

  - The Badger Report apparently indicates that 36 acres of sludge disposal impoundment are required annually. It appears that EPA has provided a capital cost for only one year (36 acres) and not the required 15 years (579 acres). Also, EPA's cost estimate does not account for the need to provide extra acreage (740 acres) for cooling water/lime slurry residence time. The estimated cost of a 740-acre unlined pond would be $43.7 million. (N-TFI 15:98-99)

    Response:

    The sludge settling/disposal impoundments referred to were indeed designed to accommodate a 15-year accumulation of process wastewater treatment sludge. The Badger Report proposed acreage based on a depth of five feet assuming the acreage was part of the cooling pond. EPA modeled a separate impoundment with a 14 foot dug out depth and a 28 foot berm, for a total depth of 42 feet. An impoundment of this configuration requires much less acreage. Furthermore, the Agency believes that the volume of the sludge disposal impoundment coupled with the large volume of the existing cooling pond, would provide adequate residence time for solids removal from the treated process wastewater stream. Commenters have provided no evidence or even a rationale supporting their contention that EPA's assumptions in this regard might be invalid. Therefore, the Agency believes that the commenters' suggestion of the actual area required for treated process wastewater and sludge management is significantly overstated.

  - Draft Florida regulations would require that the sludge management facilities be lined using either a composite or double liner with leachate collection. The estimated capital cost of a 740-acre sludge disposal pond meeting these criteria would be $276 million. (N-TFI 15:98-99)

    Response:

    EPA acknowledges that the sludge settling impoundments required under Alternative 1 would require composite liners, at least for facilities located in Florida. Therefore, to the extent that such impoundments would need to be constructed in response to new regulations, EPA underestimated the associated compliance costs in the Supplemental Analysis. EPA has, however, in response to this comment, conducted an estimation of the costs involved in installing a lined impoundment. EPA modeled a sludge disposal impoundment with a total depth of 42 feet and a total area of 80 acres (64 acres of pond and 16 acres adjoining area). The capital cost of a 64-acre sludge disposal impoundment 14 feet deep lined with a composite liner was estimated to be $25 million. Further detail is provided in the Technical Background Document.

  - Capping the lime sludge ponds after facility closure will be extremely difficult and expensive, if at all possible. Additional costs associated with closure of the lime sludge ponds are anticipated and should be included in the cost/benefit analysis. (N-TFI/AA 15:6,44)

Response:

Because of the uncertainty of the characteristics of the sludge resulting from lime treatment, there is uncertainty concerning appropriate and possible closure measures. EPA did not include closure costs in the analysis for the Supplemental Analysis based on the assumption that the sludge would be non-hazardous and would therefore not require formal RCRA closure.

- Site-specific costs are not considered and would be underestimated based on the model plant analysis. (N-SEM 4:2-3)(N-OCC 5:7-8)

  - At Seminole Fertilizer, the additional land requirements under alternative 1 would be: 60 acres for additional settling area, 60 acres for drain surge control, and 835 acres for sludge ponds, for a total of 955 acres. Assuming that these areas would have to be double-lined, as upcoming Florida regulations would require, the liner costs alone would amount to $250 million. Construction costs of just the sludge pond would likely exceed $2 million. (N-SEM 4:2-3)

  - EPA has failed to consider site specific costs that increase the estimates of the model plant. Because of reduced land availability it was necessary for Simplot to construct contact cooling towers instead of cooling ponds. Subtitle C regulations have special requirements for seismic considerations, 100-year flood plains considerations, etc., that further reduce land availability and suitability in the vicinity of the Simplot plant. These site specific characteristics would make it more costly to comply with the requirements at the Simplot plant site. (N-JRS 12:5-6)

  - Occidental would require 1,000 acres for ten years for sludge alone. This acreage, if available, would cost at least $150 million. This cost is clearly not reflected for the model plant as delineated in Appendix B-1. To meet Florida's groundwater criteria, a liner will be required. Double lined impoundments alone, included in EPA's RTC estimates, run $200,000 per acre, single liners are assumed to cost $150,000 per acre (considerably less than EPA estimates in Appendix B-3 of the Supplemental Information Analysis). (N-OCC 5:7-8)

Response:

EPA acknowledges receipt of these site-specific comments. The Agency will continue to use the waste management configuration developed for the model plant in assessing costs at specific facilities. EPA understands that composite (not double synthetic) liners may be required in Florida and has estimated the associated costs (see Technical Background Document).

Note: EPA acknowledges some uncertainty in the technical feasibility of the various aspects of lime neutralization. Consequently, the cost and impact analysis conducted for today's notice focus exclusively on [illegible]n technologies of lining waste management units, making arguments about sludge management costs moot for the Regulatory Determination decision.

8.3 Absence of Consideration of Cost of Separating Gypsum and Cooling Water

- No consideration has been given to the cost of separating the phosphogypsum (transport water) and cooling water circuits. This separation would constitute a major retrofit. Ardaman estimates the capital cost of the separation to be at least $10 million at the model plant. EPA has also ignored the increased operation and maintenance costs associated with the separation, as well as

the cost of neutralization of excess wastewater discharges which would inevitably result. The costs of in-plant stream separation are not presented. The EPA cost analyses need to include the cost of hydraulically separating the gypsum stack from the cooling pond. (A one-page description of these costs and the factors affecting them is included as are cost estimates for the construction of new lined gypsum stacks required by the short life of the model stack.) (N-TFI/AA 15:5-6)(N-IMC 6:2)(N-TFI 15:99-100)

Response:

The Agency would not necessarily require complete hydraulic separation of the areas dedicated to gypsum disposal and process water cooling. In the Supplemental Analysis, EPA discussed a number of different approaches for separately addressing contaminants contained in phosphogypsum slurry and contaminants condensed in cooling waters. These approaches do not require complete hydraulic separation. Accordingly, EPA does not believe that a plant retrofit to achieve separation of these areas would in all cases be necessary or required.

8.4 Absence of Cost Impacts of Extra Settling Area for Treated Slurry

- EPA has not considered the cost impacts of the need to provide extra settling area for neutralized phosphogypsum slurry. Under EPA's model plant scenario, most existing facilities would be required to install a new gypsum stack. Ardaman has estimated the capital cost of a new stack at $50,072,200. Because the continuing need to provide additional settling area would significantly limit the life of the stack, the "amortization" of increased compliance costs over a 15-year period is incorrect. The calculation of annual compliance costs must be revised to account for the substantially shorter operational life of the phosphogypsum stack. (N-TFI 15:100-101)

Response:

The Agency believes that the commenters' estimates of the size of new required waste management units are significantly overstated. Under the Engineering Alternatives that include treatment of the gypsum slurry (1, 2, 6, and 7), the existing stack continues to be utilized, thus eliminating altogether the immediate need for a new stack. Capital costs were considered sunk for these existing stacks as average life remaining for the model plant was assumed (based on the average for Florida facilities) to be over fifteen years. Therefore, amortization is not an issue for the existing stacks. EPA acknowledges that some uncertainty exists regarding the "stackability" of gypsum mixed with the treatment sludge and that existing stacks may be replaced sooner than expected, though not immediately. Under Alternatives requiring the construction of new stacks as a result of not treating the slurry (3, 4, and 5), additional settling area is not required and the stacks have been appropriately amortized in the Supplemental Analysis. (The same amortization procedure was used as that presented in Chapter 2 and Appendix E of the Report to Congress.)

8.5 Accuracy of Estimate of Capital Cost of Heat Exchangers

- On the basis of the cost presented (it is impossible to determine how many square feet of heat exchanger is contemplated to implement Alternative 7), it appears that EPA has significantly underestimated the capital cost of heat exchangers, given the extraordinary square footage of heat exchangers that would be required at all facilities. (N-TFI 15:101-102)

    - Chevron conducted a pilot study on the use of a secondary exchanger in conjunction with the cooling tower. As a result of the study, Chevron decided not to use secondary exchangers due to the following prohibitive installation and operating costs: (1) a massive exchanger would be required; (2) strainers would be necessary to prevent plugging; and (3) the circulation of the cooling tower stream and reactor FSA stream in plant equipment would result in significant scaling. (N-CHEV 13:7-8)

Response:

EPA acknowledges receipt of this information but has made no attempts to verify or disprove it. The information used in the Supplemental Analysis was acquired from experienced engineers within the industry and presented in the Badger Report. In any case, because EPA recognizes the technical uncertainties of Alternative 7, the cost and impact analysis conducted for today's notice focus exclusively on the proven technologies of lining waste management units, making arguments about heat exchangers moot for the Regulatory Determination decision.

8.6 Absence of Cost Estimate for New Gypsum Slurry Tank Capacity

- The cost estimates were too low because they failed to account for new, larger gypsum slurry tanks and increased power demand. (N-OCC 5:6)(N-ARC 9:9-10)(N-AGR 11:4-5)(N-JRS 12:6)(N-CHEV 13:6)(N-TFI/JAC 15:36)(N-TFI 15:102-103)

  - EPA's assumption that the required neutralization of phosphogypsum slurry can be achieved in "the existing gypsum slurry tank" is completely inaccurate. Retention times of 30-60 minutes would be required to achieve the necessary neutralization efficiency, translating into a gypsum slurry tank capacity of 130,000 gallons to 260,000 gallons. EPA should revise its cost estimate to include the capital costs for construction of new, larger tanks and for the cost of the substantial power demand required to provide the agitation capacity necessary to achieve the required neutralization efficiency. Employment of smaller tank sizes will cause a larger fraction of the purchased lime to be delivered directly, unreacted, for permanent disposal on the gypsum stack. (N-TFI/JAC 15:36)(N-TFI 15:102-103)(N-JRS 12:6)

  - Laboratory and pilot tests on the FSA stream indicate that at least 30 minutes retention time is necessary because the reaction proceeds so slowly to completion. This would make it necessary to replace the current 15,000 gallon gypsum tank with a 90,000 gallon tank. A 500 hp motor would be required to properly agitate liquids in the tank. The gypsum tank and stack are two miles apart. The pipe connecting the two is virtually impossible to clean and would need to be replaced frequently due to scale build-up. (N-CHEV 13:6)

  - The proposed neutralization of gypsum slurry in the existing tank is not feasible for the Agrico SPCW plant. The existing slurry tank is relatively small and would not provide the necessary retention time for the neutralization reaction. The existing tank is a flow-through vessel with a retention time of approximately five minutes. The necessary retention time for the neutralization reaction is estimated to be one hour. Use of the existing tank will result in an incomplete reaction. The EPA proposal would require the installation of an additional, much larger tank for neutralization of gypsum slurry. The cost of this tank has not been included in the EPA cost analysis for the Supplemental Analysis. (N-AGR 11:4-5)

  - Neutralization of gypsum circuit water in an existing gypsum slurry tank will require addition of lime slurry, reaction, and growth of dicalcium phosphate and calcium fluoride crystals. Unless sufficient time is allowed, a solution supersaturated with calcium, phosphate, and fluorides will quickly scale and shut down all elements of the gypsum transport system. It is assumed that only one hour of retention time would be necessary though retention time in typical gypsum crystallizers (phosphoric acid reactors) is on the order of four hours. No existing gypsum slurry tank at Occidental and probably in the industry is large enough. For the three plants we estimate new tankage and agitators to cost over $4 million. No costs were provided for this operation in the Supplemental Information Analysis. (N-OCC 5:6)

- Lime consumption and acidity loss would be greater than contemplated because of the need to neutralize the sulfuric acid acidity added at the hydration step. The high sulfate concentration would ensure the precipitation of more-than-contemplated quantities of calcium sulfate. Thus, the gypsum tank would have to be replaced with a tank designed to provide adequate agitation and retention time for complete neutralization and precipitation. Scaling problems could be experienced that would require frequent downtime for cleaning the tank and line. Due to the short comment period, Arcadian has not had time to perform the engineering studies and cost estimates necessary to design a new gypsum tank and estimate its cost, but preliminary estimates indicate that it would cost more than $200,000. (N-ARC 9:9-10)

Response:

In conducting its analysis for the Supplemental Analysis, EPA assumed that the existing gypsum slurry tanks would be sufficient for handling the extra feed and would not need to be expanded. The basis for this assumption was that the slurry tank acts as an agitator and that the residence time includes that time spent in the pipeline as well as in the settling pond before the material actually settles. Because EPA is aware of the uncertainty of the technical feasibility of treating the slurry, the cost and impact analysis conducted for today's notice focus exclusively on the proven technologies of lining waste management units, making the argument about slurry tank capacity irrelevant to today's Regulatory Determination.

8.7 Accuracy of Estimate of Lime Requirements

- EPA has underestimated the amount and cost of lime requirements for treating slurry and cooling water. (N-SEM 4:2)(N-AGR 7:2-3)(N-ARC 9:9-10)(N-JRS 12:6)(N-CHEV 13:5)(N-TFI 15:103-105)(N-TFI/JAC 15:25-26)

  - Jacobs calculates that EPA's estimates of the lime demand necessary to raise both the existing phosphogypsum transport water (0.183 lbs/gallon) and the existing cooling pond water (0.244 lbs/gallon) to a pH of 3.5 are lower than the lime demand stated to be required in the Badger Report (0.26 lbs/gallon for both). Badger has also underestimated the lime demand associated with neutralization of gypsum transport water stored in the existing stack, because they have erroneously assumed that the water would drain at an even rate over the 15-year life of the model plant. In fact, drainage would be more rapid in early years and this differential drainage rate would have an effect on lime demand. Therefore, EPA has underestimated the raw material cost of implementing compliance Alternatives 1 and 2. In addition, lime demand would be increased over that required at the model MGA-only plant to the extent that the facility produced other products (e.g., triple superphosphate) that were a source of additional acidity. EPA must take these additional, site-specific costs into consideration in a site-by-site analysis of the cost of implementing the suggested Subtitle C compliance alternatives. (N-TFI 15:103-105)

  - EPA reports a required liming capacity for the cooling pond of 82 tpd and for the gypsum stack of 34 tpd. This liming capacity would be sufficient to treat the prescribed volume of water only if treatment were conducted over 365 days/year and at a rate of only 0.244 lb lime per gallon of pondwater and 0.183 lb. lime per gallon of gypsum loop water. This rate is less than the 0.26 lb/gallon described elsewhere by Badger as appropriate. (Includes estimates of the lime requirements to raise the existing cooling pond and gypsum stack transport water and seepage to a pH of 3.5 as well as estimates of the lime requirements to sustain the cooling pond loop and the gypsum loop at a pH of 3.5 after equilibrium is reached.) (N-TFI/JAC 15:25-26)

- The cost of lime at the Chevron facility is approximately $80 per ton delivered. The total cost of lime alone is over $4 million per year. This is slightly higher than EPA's estimates. (N-CHEV 13:5)

- The Agrico Faustina plant has a higher level of acidity in the cooling pond water, so costs associated with the liming would be proportionally higher. (N-AGR 7:2-3)

- At the Arcadian facility the gypsum slurry water is more acidic than such water at most phosphoric acid plants and it contains a greater soluble sulfate concentration than most gypsum waters. Thus, liming gypsum slurry to a pH of 3.5 at Arcadian would incur costs never recognized in the analysis of the model plant. (N-ARC 9:9-10)

- At Seminole Fertilizer, neutralizing all of the existing inventory of pond water to pH 3.5 would cost approximately $11 million (4,500 acre/ft. pond water, using 0.21 lb. CaO/gallon pondwater @ $70/ton CaO). (N-SEM 4.2)

Response:

The analysis of incremental lime demand presented by the commenters significantly overstates the cost impacts of new regulatory requirements. The estimates of lime demand are substantially higher than EPA's estimates, the reasons for which have not been adequately explained to the Agency. Furthermore, the comments focus on a worst-case scenario under which every plant would lime treat all of its special wastes. This is but one option among many. EPA believes that most facility operators, when provided with the incentive to comply in a least-cost manner, would develop alternatives to lime treating all of their wastes, thus greatly reducing the amount and cost of the lime required. There is a discrepancy between the initial costs estimated by Badger for lime demand and those finally estimated by EPA. The numbers provided by Badger did not coincide exactly with the technical processes involved in EPA's Engineering Alternatives. Consequently, the costs provided by Badger were used to estimate overall costs for lime demand under the relevant alternatives. Regardless of the preceding discussion, however, EPA does have some concerns about the efficacy of a lime treatment strategy and has, therefore, considered only the proven technology of lining waste management units for purposes of today's analysis.

8.8 Absence of Differential Costs of Treatment for Toxic Wastes

- EPA has incorrectly ignored the differential cost that would be imposed by Subtitle C regulation on facilities managing characteristically toxic phosphate rock processing wastes. EPA's analysis must include an analysis of the differential cost and economic effect imposed on the management of characteristically toxic wastes. (N-TFI 15:105)

- Facilities that have toxicity characteristics in the gypsum tank would be faced with a much greater cost if the wastes are regulated under Subtitle C. Four facilities, including Simplot, have toxic concentrations in their tank or mixing basin waters. EPA has failed to include the full cost of compliance for Subtitle C for these facilities. (N-JRS 12:5)

Response:

EPA was not able to consider many site-specific factors because of time constraints. Nevertheless, because EPA recognizes the uncertainties regarding the technical feasibility of lime treatment, the cost and impact analyses focus exclusively on the proven technologies of lining waste management units, which should prevent the migration of toxic materials and facilitate compliance for these facilities.

8.9 Economic Feasibility of Increasing Filter Area

- Increasing the filter area, contrary to EPA's analysis in the Supplemental Analysis, is not cost-effective. EPA has underestimated costs, overestimated current P_2O_5 losses and, therefore, future P_2O_5 recovery, and overvalued the P_2O_5 recovered. EPA has, furthermore, not taken into account site-specific factors. Consequently, the installation of extra filter capacity before lime neutralization would not be economic and EPA's estimate of the annual compliance costs for the phosphogypsum slurry neutralization aspects of the alternatives is understated by $917,800 for the model plant. (N-OCC 5:5)(N-IMC 6:2)(N-ARC 9:5)(N-TEX 10:5-7)(N-AGR 11:2-3)(N-JRS 12:2-6)(N-CHEV 13:2-3)(N-TFI 15:105-106)(N-TFI/JAC 15:6-8)

Response:

At least one facility in Florida plans to install a similar filter system and expects to pay off its installation costs in one year. If it were not economically feasible and even profitable to install extra filtration, this particular facility would not be undertaking the effort to do so. Nevertheless, because EPA recognizes the uncertainties regarding technical feasibility of other aspects of Engineering Alternatives 1, 2, and 7, subsequent cost and impact analyses focus exclusively on the proven technologies of lining waste management units, making the question of the feasibility of increasing filter area irrelevant for purposes of the Regulatory Determination.

- EPA has underestimated the cost of the additional filtration. The cost of installing filtration, based on Simplot experience last year, is 70 percent higher than EPA's estimate. Using the 0.6 power rule for estimating costs, a 320 square foot filter (the size assumed by EPA) would cost $3.6 million. This represents a cost of $1.5 million more than EPA's estimate. (N-JRS 12:4,6)

Response:

In estimating the costs of additional filtration in the Supplemental Analysis, EPA used information obtained from engineers well-versed in the industry. The estimates were developed by engineers who design these filtration systems and were based on actual equipment and prices lists. That information is included in The Badger Report and was therefore made available to commenters for review. These cost estimates were performed for a filter sized for the model plant. EPA believes that this method is superior to an extrapolation based on the commenter's experience. EPA estimated the capital costs to be $2.2 million, with an annualized compliance cost of $320,000. Assuming, as the commenter has done, a capital cost of $3.6 million, the annualized compliance cost would be $625,000. This increase of $305,000 does not significantly change results of the analysis and the conclusion favoring filtering and treating the waste is still reached, regardless of the relative merits of the methods used to estimate these numbers.

- EPA incorrectly assumed in the Supplemental Analysis a value of 4 percent soluble loss from the filter. (N-TFI 15:105-106)(N-JRS 12:5)

  - Gardinier reported to EPA 1.5 percent to 2 percent loss from the filter, which is typical of a filter operating at well over 0.9 tons of P_2O_5 produced per day per square foot of filter area. EPA's error is apparently the result of a confusion between losses from the filter due to filter inefficiency and the total losses of soluble P_2O_5. While the total losses as soluble P_2O_5 may be reasonably assumed to be 4 percent, the losses from the filter itself seldom, if ever, exceed 2 percent. The remainder, 2 percent to 3 percent, is composed of the leaks and spills which are inevitable in a complex plant. (N-TFI/JAC 15:6)

  - There are four types of P_2O_5 losses in a phosphoric acid plant: (1) citrate insoluble loss, due to unreacted phosphate rock, about 1 percent of the input P_2O_5; (2) citrate soluble loss, due to co-crystallization of P_2O_5 with gypsum through isomorphic substitution of

HPO_4^{-2} for SO_4^{-2}, about 2-4.5 percent of P_2O_5, (3) water soluble losses, due to incomplete washing of the gypsum cake, about 0.5 percent of input P_2O_5; and (4) mechanical losses due to spillage, leakage, filter and pipe washing, evaporator carryover and losses as sludge. This loss could be up to 4.5-5 percent P_2O_5 input. (N-JRS 12:2-3)

- Assuming 1.75 percent P_2O_5 filter losses from an 1,111 square foot filter in a 1,000 TPD plant, the reduction in filter losses due to the installation of an additional 320 square foot filter in parallel would be most unlikely to exceed 0.75 percent for several reasons. First, a certain amount of acid is trapped between gypsum particles in such a way that additional washing time does not dislodge it. Second, part of the filter loss is due to acid clinging to the bottom and corners of a pan and increasing the number of pans and the area of the bottom will actually increase this loss. Third, the increased complexity of the system will cause additional leaks and spillages. Finally, the operational problems associated with operating two filters in parallel are bound to result in some additional inefficiency. The actual P_2O_5 gain to the producer would be some fraction of the 0.75 percent decrease in filter losses, since, even after liming to pH 3.5, some portion of the water soluble P_2O_5 would be recovered when washing the filter cake with pond water. (N-TFI/JAC 15:7-8)

- Using a more realistic value of 0.75 percent decrease in filter losses, the provision of an additional filter would be uneconomic. The total annualized new cost of adding additional filtration, recovering additional product acid, and then treating the slurry at a reduced rate is higher ($7,854,850) than the cost of treating the slurry without additional filtration ($7,125,900). This ignores other flaws in the original calculation by EPA. EPA assumes that P_2O_5 is recovered 365 days a year, while a phosphoric acid plant operates, at most, 330 days a year on average. Furthermore, the value of $300 per ton P_2O_5 assumed by EPA is tantamount to an assumption that an unsatisfied demand for merchant grade phosphoric acid exists. (N-TFI/JAC 15:8)

- The addition of gypsum filtration area using a parallel filter will recover only a portion of a 1 percent loss. Occidental used a 1 percent water soluble P_2O_5 loss in the gypsum cake off the filter to calculate the penalty associated with neutralization of pond water in the June 20, 1990 appraisal (other losses were additive to a total of 4 percent). Industry cannot justify the high capital and operating costs of another parallel filter installation to recover a portion of a 1 percent loss. (N-OCC 5:5)

- Insufficient filtration area can lead to water soluble phosphoric acid losses. On the other hand, an "extra" filter would have its own unavoidable losses through leaks, spills between pans, etc. Thus, installation of an additional filter where additional capacity is not needed could prevent recovery of additional product and reduction of the quantity of lime to a pH of 3.5. In fact, this additional capacity could result in increased lime use - a factor EPA has not considered in its analysis for the Supplemental Analysis. (N-ARC 9:5)

- EPA erroneously concluded that the 4 percent loss of water soluble P_2O_5 in the model plant was the result of insufficient filter capacity. Agrico's P_2O_5 recovery averages about 96 percent of the available P_2O_5. Approximately one percent of this loss is across the filter. The remaining loss occurs throughout the balance of the process. The projected cost savings resulting from increased filter area will not be realized at the Agrico SPCW. (N-AGR 11:2-3)

- Increasing the filter area and reduction of P_2O_5 losses is not a direct relationship. This is because there are two types of washing that occur to recover P_2O_5 trapped within the gypsum cake. The first type of washing is direct displacement, which could have a direct relationship with increased filter size. The second type of washing is diffusional, only partly affected by filter area. The phosphate facilities analyzed in the Badger Report have

a filtration rate of 0.9 tons per day per active square area compared to 0.35 tons per day for the Chevron facility. The difference is caused by differences in the phosphate rock feed. The size and shape of the gypsum crystal produced from Chevron's rock is more difficult to filter. If increased filter area were to be one of the chosen management alternatives, Chevron would be at a significant disadvantage because a much larger (2-3 times) filter area would be necessary to have the same effect as filters at other facilities. (N-CHEV 13:2-3)

- EPA believes that increasing the filter area will increase P_2O_5 recovery and thus reduce the acidity of the "process wastewater." Since the "treated" process wastewater (ph 3.5) will still be utilized in the phosphoric acid plant, however, substantial additional scaling will occur within the plant and across the filters. The silica gel will also be present in the process wastewater and thus in the phosphoric acid processing system. The additional calcium scale formation and silica will off-set the benefits of additional filtration area. (N-TEX 10:5-7)

Response:

EPA disagrees with the above comments. The arguments and analyses are not supported for a number of reasons. The key underlying assumption in these arguments is that no facility incurs losses of more than 2 percent at the filter. In the process of gathering information for the analysis for the Supplemental Analysis, however, EPA was told by representatives of several facilities that losses of greater than 2 percent are experienced on a regular basis, (see, for example, trip reports appended to the Supplemental Analysis). Through information obtained from site visits and other sources, EPA understands that the filtration operation constitutes the bottleneck at most phosphoric acid plants. The justification for installing additional filtration is to relieve this bottleneck, thereby allowing operations to be run more efficiently, (i.e., with less spillage and a longer residence time on the filter). Furthermore, the implementation of this Alternative would not involve adding more pans to existing tilting pan filters, but installing higher efficiency UCEGO filter systems that allow greater recovery of P_2O_5. Consequently, many of the statements made by commenters are completely misdirected. Finally, as evidence of the validity of EPA's assumptions with regard to filtration, the Agency notes that at least one facility plans to add a new filter in parallel with existing operations, and expects to pay off the costs of this system within one year.

- It would not be possible to increase the filter area by 30 percent. The majority of filters used in the U.S. phosphoric acid industry are of the Bird-Prayon tilting pan design. Enlarging this filter would involve dismantling and rebuilding the filter with new rails, new lever arms, and new larger pans. Auxiliaries such as vacuum pumps would also have to be replaced. The UCEGO filter assumed by EPA is also circular of a rotating table-type and is equally incapable of being enlarged. The only way to provide the additional filter area is to build an additional filtration station including building, piping, receivers, pumps, and seal tanks. (N-TFI/JAC 15:7)

Response:

The commenter has completely misinterpreted the mechanics involved in installing additional filtration capacity. The intention of Alternatives 1, 2, 6, and 7 is to install an additional parallel filtration system, not to rebuild the existing filter with additional pans, which would likely be infeasible.

- The recovery value of the phosphoric acid is overstated by 50 percent. EPA has overstated the value of the P_2O_5 recovered through filtration by assuming it is equal to 100 percent of the 1989 sales price of $300 per ton of 54 percent phosphoric acid. The recovered phosphoric acid value is closer to $190/ton. (N-JRS 12:4-6)

Response:

Because the commenter did not provide any rationale or basis for the suggested change in assumed product price, EPA is unable to respond to this comment, other than to state that the Agency believes that the $300 assumed price is fully supported by the data provided by industry both prior and subsequent to release of the Supplemental Analysis.

8.10 Absence of Cost of Effects of Neutralization on Recovery of P_2O_5 from Process Wastewater

- The model does not calculate phosphate and acid values recovered from pond water. The omission of such calculation is a major error. (N-TFI/JAC 15:2-3)

  - The current system of recycling process wastewater allows facilities to recover significant P_2O_5 values. This recovery will be reduced under EPA's neutralization scenarios by an estimated 2.47 percent, costing $4.80 per ton of P_2O_5 at the model plant. This additional cost has been ignored. (N-TFI 15:106)

  - Proposed treatment would precipitate all of the P_2O_5 values in the process wastewater. This would essentially result in a loss of phosphate recovery. If applied to Texasgulf's facility, 71,500 tons of Texasgulf's phosphate production would be lost annually. This loss equates to $24 million per year based upon current operating practices. (N-TEX 10:8)

  - The Base Case Process Flow Diagram in Appendix C ignores the advantages of recycling acidic pondwater to the reaction and filtration system in P_2O_5 recovery. A computer model prepared by Jacobs shows that the present system of recycling pond water increases the production of phosphoric acid by 45 tons per day. This is greater than the 4 percent or 40 tons per day soluble loss of P_2O_5 due to the continued reaction and gypsum recrystallization in the gypsum stack. Liming the pond water to pH 3.5 as in Alternative 1 would reduce the amount of P_2O_5 recovered by 24.7 tons per day. The cost of this reduced yield in terms of raw materials usage is $4.80 per ton of P_2O_5 produced. (N-TFI/JAC 15:10-11)

Response:

EPA assumed for the Supplemental Analysis that, as the slurry was treated only to 3.5, much of the entrained product acid would be available for recycling even after treatment. Therefore, no or little loss of P_2O_5 due to lime treatment is expected and no costs are incurred. Should this assumption be inaccurate, EPA acknowledges that some P_2O_5 value would be lost. Furthermore, while the Agency recognizes that some product may be lost by treating the slurry with lime, the Agency does not believe that all product acid sent to, and stored in, the gypsum stack is "caught" and returned (i.e., acid is lost due to seepage from the units). The Agency is additionally concerned with the environmental effects of storing product acid in unlined units and transporting product acid in unlined ditches at the majority of phosphoric acid facilities.

- The analysis in the Supplemental Analysis of the cost of liming unreasonably ignores large, site-specific effects. For example, at several facilities cooling pond water is used to scrub the gases from the plant making granular triple superphosphate (GTSP). Dust losses from the GTSP plant to the pond water were estimated by one producer at 4 percent of the P_2O_5 fed to the GTSP plant. In other words, four percent of 130,000 to 300,000 tons of P_2O_5 enters the cooling pond water due to dust losses, ending eventually as P_2O_5 recycled to the phosphoric acid plant, where it is recovered as phosphoric acid. These producers could not afford to lose such a large amount of P_2O_5. Liming the pond water would precipitate this P_2O_5, preventing recycle to the phosphoric acid plant. (N-TFI/JAC 15:3)

Response:

EPA assumed for the Supplemental Analysis that because the process wastewater will be treated only to a pH of 3.5, large portions of P_2O_5 are not removed, thus making it available for recovery. EPA recognizes that there are site-specific factors that were not considered in the analysis for the Supplemental Analysis. The model plant analysis method was not designed to account for site-specific differences.

8.11 Accuracy of Estimate of Cost of Additional Sulfuric Acid

- EPA has significantly underestimated the cost of additional sulfuric acid that would be required if the Agency's Subtitle C compliance alternatives are implemented. Furthermore, EPA provides no basis for their estimate of $138,000 per year in additional sulfuric acid costs. (N-JRS 12:6)(N-TFI 15:107)(N-TFI/JAC 15:15-16)

  - The total increase in sulfuric acid usage, according to the Jacobs Report in Alternatives 1 and 2 is 189.7 TPD, at an additional daily cost of $7,783.00, or an additional cost of $8.46 per ton of P_2O_5 produced. (N-TFI 15:107)(N-TFI/JAC 15:16)

  - Based on the data and the method of calculation given under the subject "Adequacy of Model (Base) Plant," calculations for calcium returned to the reaction and filtration system in Alternatives 1,2, and 7 result in an additional cost of sulfuric acid usage of $1.78 per ton of P_2O_5 produced. (N-TFI/JAC 15:15)

  - Treating the gypsum slurry by liming will increase the sulfuric acid cost by several dollars per ton. (N-JRS 12:6)

  - Fluosilicic acid recycle back to the reactor has been used industrially to substitute for sulfuric acid. The reduction in H_2SO_4 varies between 2 percent and 6 percent in comparison with plants with no recycle of fluosilicic acid. This saving in H_2SO_4 will be completely lost if the streams are separated and neutralized to pH 3.5, which will precipitate all the fluoride. Therefore, the additional sulfuric acid usage necessary in Alternatives 1 and 2, due to this cause, is 149.7 tons per day. The cost is $6.68 per ton of P_2O_5 produced. (N-TFI/JAC 15:15-16)

Response:

In the Supplemental Analysis, EPA's analysis of the cost of additional sulfuric acid was based on the following estimates: 0.01 tons of sulfuric acid will be required per ton of P_2O_5 produced. Multiplying this by 1,000 tons of P_2O_5 fed per day results in 10 tons of H_2SO_4 required per day. With a 365 day production year, and a cost of $37.80 per ton H_2SO_4 (as produced on-site at a Florida facility cited in a TFI report), the resulting cost is $138,000 per year. Assuming a 330-day operating year, the resulting cost is $125,000. The estimate that 10 tons of H_2SO_4 would be required per day was provided to EPA by an industry engineer and the cost of H_2SO_4 per ton was similarly supplied by an expert in the field. Regardless of this discussion, however, EPA recognizes the uncertainty regarding the large-scale lime neutralization required for compliance. Consequently, the cost and impact analysis conducted for today's notice focus exclusively on the proven technologies of lining waste management units and additional sulfuric acid use would therefore not be required.

8.12 Accuracy of Estimate of Cost of Lost Production

- The cost of lost production from scaling, fluoride recovery, formation of silica gel, increased temperature of evaporators, and failure to recycle acidic pond water has been underestimated. (N-JRS 12:3,6)(N-TFI 15:107-109)(N-TFI/JAC 15:17-22)

  - The downtime for maintenance will increase significantly because the proposed treatment will result in increased calcium, sodium, magnesium, and potassium in solution and increased scaling. Production losses could be equal to or greater than 15 percent. (N-JRS 12:3,6)

  - Treating the gypsum slurry by liming will cause a loss of phosphate equivalent to several dollars per ton. (N-JRS 12:6)

  - EPA has underestimated the cost of lost production, production loss from scaling, that would result from the implementation of the Agency's Subtitle C compliance alternatives at $3,786,500. This estimate is based on information received from the phosphoric acid industry that states a reduction in production by at least ten percent. The letter that references this estimated reduction addressed the neutralization scheme proposed in the RTC, not the EPA Supplemental Analysis compliance alternatives. (N-TFI 15:107-109)

  - The Jacobs Report estimates that operational effects of neutralization to pH 3.5 would be equivalent to a loss of production time of at least 15 percent. In Alternatives 1, 2, and 7, due to the variability in solubility of fluosilicates with temperature, there is a tendency for scale to form in the reaction system during slurry cool-down, in the filtration system, and in the product acid piping. These scaling concerns will be magnified by the introduction of a liming system. Scale formation on the filter is one of the main causes of lost production in a phosphoric acid plant. The use of pond water neutralized to pH 3.5 will cause the formation of a strongly adhering scale due to the monocalcium phosphate in solution in the pond water. This would in all likelihood reduce plant capacity to 85 percent of the current plant availability. Furthermore, the precipitation of salts will occur throughout the neutralization reaction, causing the formation of scale on the walls of the gypsum slurry tank and pipework; the packed reaction fume scrubber will also be susceptible to more than normal scaling. The resulting loss of production time will be at least 15 percent and is not a feasible way of operating a phosphoric acid plant. (N-TFI 15:107-109)(N-TFI/JAC 15:17-20)

    - Jacobs calculates the cost associated with downtime resulting from neutralization in Alternative 1 to be $5,829,000 per year or $22.59 per ton of P_2O_5 produced. The lost product from Alternative 1 will be 45,540 tons of P_2O_5 per year (330 days x 920 tons/day x 15%). There will be no savings during these lost production times, other than in raw materials usage. Additional costs of maintenance would be incurred. Based on a sales price of $307 per ton P_2O_5 and a raw material cost of $179 per ton P_2O_5, the lost production cost will be $128 per ton of P_2O_5 not produced. (N-TFI:107-109)(N-TFI/JAC 15:21-22)

    - EPA has completely failed to account for the additional lost production that could be expected from the implementation of compliance Alternatives 2 and 7. for Alternative 2, 51,612 tons of P_2O_5 per year (330 days x 920 tons/day x 17%); and for Alternative 3, 60,720 tons of P_2O_5 per year (330 days x 920 tons/day x 20%). As indicated immediately above, the lost production cost will be $128 per ton of P_2O_5 not produced. It is not unreasonable to suggest a total reduction in plant utilization of at least 20 percent resulting from fluoride recovery from the flash cooler and the reactor fume scrubber in Alternatives 2 and 7. No means has

been found to reduce the P_2O_5 content of the fluosilicic acid sufficiently to make a marketable product. There are also difficulties associated with the formation of silica gel in such systems, which will generally be dirty and difficult to operate. Furthermore, since the barometric condenser cooling water will now be the product of indirect cooling (in Alternative 7), it will be hotter than water from the cooling pond, increasing water flow requirements and causing the phosphoric acid evaporators to run hotter. The effect of this on the rubber linings of vessels and pipes, on the corrosion of pumps, and on the scaling of heat exchangers and evaporator bodies cannot be quantified. (N-TFI:107-109)(N-TFI/JAC 15:20-22)

Response:

Because EPA recognizes that the technical and economic feasibility of some aspects of the treatment alternatives are uncertain, the cost and impact analysis conducted for today's notice focus exclusively on the proven technologies of lining waste management units.

8.13 Absence of Consideration of Cost of Lost Efficiency When the Model Plant is Operating

EPA failed to adequately consider the cost of lost efficiency. (N-TFI 15:109)(N-TFI/JAC 15:23-24)(N-CHEV 13:4-5)

- EPA has failed to consider the cost of lost efficiency when the model plant is operating. EPA's cost estimates address only the costs associated with production which is lost when the model plant is down for maintenance and cleaning. Other factors associated with the implementation of EPA's Subtitle C compliance alternatives will also adversely affect the output of the model plant while it is operating. For example:
  - A beneficial effect of the present system of recycling acidic pondwater is the increase of sodium and fluosilicates in solution in the reaction slurry. This improves filtration rates. U.S. plants using the pondwater system often operate at filtration rates of 0.9 to 1.0 tons of P_2O_5 produced per square foot of filter area per day when processing Florida phosphate rock.
  - One of the effects of liming pond water is to precipitate a gelatinous colloidal form of silica. Some of this silica would be precipitated even when the slurry transport water and the barometric condenser waters are separated. Not all of this silica can be expected to be retained in the gypsum stack. Therefore, the returned transport water used to wash the filter cake will contain some colloidal silica of a gelatinous nature which will reduce the filtration rate.
  - As a result of the additional sulfuric acid usage and increased raw material usage, more gypsum will have to be filtered off per ton of P_2O_5 produced.
  - The increased frequency of shut-downs has a direct effect on output. P_2O_5 is lost to pond water whenever any equipment is shut down and washed, to make it fit for cleaning. Only part of this P_2O_5 could be recovered from the limed transport water. None would be recovered from limed cooling water. In addition, plants can seldom, if ever, be restarted at full capacity and normal P_2O_5 recovery after a shut-down.

In the absence of empirical evidence, it is impossible to show qualitative evidence of the reduction in plant output due to the above factors. Each of these, however, is very significant; it would be unreasonable to expect a reduction of less than 50 tons per day costing $7.36 per ton P_2O_5 produced. (N-TFI 15:109)(N-TFI/JAC 15:23-24)

- The operating factor for the Chevron facility's phosphoric acid plant with the reactor and evaporator FSA scrubbers operating is around 84 percent. This is well below facilities without FSA scrubbers. The estimated operating factor for the neutralization system equipment is 80 percent, resulting in an overall operating factor of 67 percent, not including additional scaling, gelling, etc. (N-CHEV 13:4-5)3

Response:

EPA recognizes that some loss in operating efficiency would probably occur aside from the additional losses from down-time. In the Supplemental Analysis, EPA assumed losses of $113,600/year due to loss of efficiency at the filter. EPA understands that a great deal of uncertainty exists regarding the scaling and filtration efficiency losses following implementation of alternatives involving lime treatment, FSA recovery, or heat exchange. The cost and impact analysis conducted for today's notice focuses exclusively on the proven technologies of lining waste management units. The question of loss of operating efficiency has been set aside in developing the Regulatory Determination.

Lack of Clarity

- For Engineering Alternative 3 it is not clear whether the costs associated with lost capacity of existing management facility is included in the total cost shown on page 36. (N-GRD 8:3)

Response:

The baseline capital cost was discounted for the model plant scenario and included in the incremental cost.

8.14 Absence of Consideration of Cost of Treating Excess Discharge Occasioned by Implementation of Alternative 7

- EPA has failed to account for the cost of treating excess discharge occasioned by the implementation of compliance Alternative 7. Assuming that all discharged water has been neutralized to pH 3.5, the quantity of lime required to meet Florida standards, starting with monocalcium phosphate, is that required to precipitate dicalcium phosphate. The additional lime required is 0.11 lb CaO per gallon of water. The cost of lime needed to treat the additional effluent generated in a plant built or modified to Alternative 7 is therefore $3.71 per ton of P_2O_5 produced. The capital cost of liming the additional discharge, including the liming station, will be $1,245,000 and the operating cost will be $4.77 per ton of P_2O_5 produced. (N-TFI:110-111)(N-TFI/JAC 15:33-34)

Response:

EPA acknowledges this comment. For the Supplemental Analysis, EPA assumed that surge capacity would be built into the system. In addition, EPA is aware that most facilities have existing capacity for treating any discharge in such situations.

- The incremental annualized compliance cost for EPA's Engineering Alternative 7 for Texasgulf would be $51 million to $54 million when evaluated using the following assumptions: (1) the treated phosphogypsum slurry (pH = 3.5) would exhibit the same stacking characteristics as existing phosphogypsum slurry; (2) the treated phosphogypsum slurry (ph = 3.5) would exhibit no hazardous waste characteristics; and (3) Texasgulf could sell 100,000 tons of fluosilicic acid per year at a price of $10 per ton. If assumption 3 above is not valid, an additional $10 million would be required. The costs do not include the cost of disposing of the extra fluosilicic acid if the product can not be sold. (N-TEX 10:3-4)

Response:

In response to assumption (3) in this comment, EPA has assumed that facilities will derive no income from fluosilicic acid, and has therefore estimated the revenues for FSA into the analysis at $0 per ton. EPA's extrapolation of costs indicates that the compliance cost of Alternative 7 for the Texasgulf facility would be $63.6 million dollars.

9.0 ECONOMIC EFFECTS

- The Engineering Alternatives offered in the NODA are not economically feasible. They have misrepresented the actual impact on industry operations. (N-GRD 8:2)

Response:

EPA recognizes that implementation of the alternatives would result in significant economic impacts on the industry. As stated in the Supplemental Analysis, however, the analysis focused on the technical feasibility and cost of the alternatives.

- The Agency has made no effort to analyze the potential economic effects of the implementation of the suggested Subtitle C compliance alternatives on the American phosphate rock processing industry. (N-TFI 15:111)

Response:

In response to this comment, EPA has estimated compliance costs and impacts for all domestic phosphoric acid plants. Results of this exercise are presented in the Technical Background Document.

- EPA's assumption that it is not important to perform a detailed analysis of the economic impacts the Alternatives would have on the phosphoric acid industry or its markets is incorrect. For example, if the cost to the industry for compliance with the least-cost alternative for each facility significantly exceeds the freight costs of importing phosphate fertilizer materials from foreign countries, then the foreign competition will be able to undersell the domestic industry and drive the domestic industry out of business. (N-JRS 12:1-2)

Response:

EPA in no manner assumed that a detailed analysis of the economic impact of the Alternatives on the market and the industry was not important. However, due to time constraints, such an analysis was not performed. EPA recognizes the importance of these impacts but focused on the technical feasibility and cost of the Engineering Alternatives in the Supplemental Analysis. In support of today's Regulatory Determination and in response to comments, the Agency has conducted an analysis of the economic impact of selected Engineering Alternatives. This analysis is presented in the Technical Background Document.

Jacobs Economic Analysis

- An analysis addressing the incremental cost of compliance estimated in the EPA Supplemental Analysis was performed by economic experts at Jacobs and is presented in Section 3 of the Jacobs Report. The only adjustment that has been made is to correct the obvious error of calculating the annual incremental compliance cost per ton of P_2O_5 produced on the basis of a 365-day operating year. As part of its analysis, Jacobs considered the significance of the incremental compliance costs associated with the implementation of Alternative 1 as measured by the ratios employed by EPA in the RTC for evaluating the significance of incremental compliance costs. The ratios calculated by Jacobs far exceed the EPA standards and evidence the catastrophic impact of these compliance costs on the current industry economics.

> The Supplemental Analysis [Phosphoric Acid Report] estimates the Incremental Compliance Capital Cost as $24.6 million and the Annual Compliance Cost as $14.8 million per year for the model plant. The compliance cost per ton P_2O_5 is $481.03 for Compliance Capital Costs and $48.75 for Annual Compliance Costs. The Baseline Compliance Cost for the model plant is $5.27 per ton P_2O_5. The significance of the compliance costs of Alternative 1, using

EPA's ratios of Annual Compliance Costs/Value of Sales, Annual Compliance Costs/Value Added, and Compliance Capital Costs/Current Capital Outlay is 16 percent, 38 percent, and 300 percent, respectively, which is much higher than EPA's standards of 1 percent, 1 percent, and 5 percent. (N-TFI/JAC 15:54-55)(N-TFI 15:111-113)

Response:

EPA acknowledges receipt of this information. In response to commenters' concerns regarding the use of a 365-day operating year, EPA has revised its economic analysis presented in the Supplemental Analysis using a 330-day operating year. The results of this analysis are presented in the Technical Background Document. EPA recognizes that the ratios of Annual Compliance Costs/Value of Sales, Annual Compliance Costs/Value Added, and Compliance Capital Costs/Current Capital Outlay may exceed the screening criteria thresholds of 1 percent, 1 percent, and 5 percent, respectively.

Effects on the Competitiveness of the Industry

- As a result of increased compliance costs, U.S. producers will lose foreign and domestic markets. (N-TFI/JAC 15:59,60,62,69)(N-TFI 15:111-113)

  - Jacobs analyzed the effect of Alternative 1 incremental compliance costs on the competitiveness of the American phosphate industry in foreign and domestic markets, as well as the ability of the industry to pass through the incremental compliance costs. Jacobs concluded that export markets, now accounting for 45 percent of sales, will be lost and foreign penetration of domestic markets might occur. Given the EPA estimated incremental compliance costs of $41.17 for Alternative 2 and $49.74 for Alternative 7, conclusions concerning the economic effect of those alternatives would be the same as those expressed from the evaluation of Alternative 1. It is clear that the implementation of EPA's Subtitle C compliance options would make competitive production infeasible. (N-SEM 4:4)(N-TFI/JAC 15:69)(N-TFI 15:111-113)

  - The world WPA P_2O_5 production capacity of 37 million tons is adequate to supply projected demand for three or four years. (An analysis of the probable sources of future supply was included.) The U.S. industry is dominant in supplying P_2O_5, but U.S. WPA future production cost will have less competitive advantage over foreign suppliers in international markets as a result of having to increase investment. Additional compliance costs would severely exacerbate this situation. (N-TFI/JAC 15:59)

  - Attempts by U.S. fertilizer producers to significantly increase the price of fertilizer to countries importing from the U.S. will most likely result in loss of markets to foreign producers. The imposition of the estimated incremental compliance costs for Alternative 1 could lead to penetration of domestic markets by foreign producers because freight from Morocco and other exporting countries is less than the proposed compliance cost. Price increases of $48.75 per ton would increase the average U.S. MGA price to $355.75 per ton P_2O_5, up 16 percent. This will increase agricultural production costs and increase food prices to U.S. citizens, decrease exports of agricultural products, bankrupt more U.S. farmers, increase U.S. government subsidiaries, and/or increase the U.S. deficit. (N-TFI/JAC 15:62)

  - The hike in the price of phosphoric acid (the EPA Supplemental Analysis estimates a minimum of $35/ton phosphoric acid) would eliminate SFC's ability to compete in foreign markets, seriously hurt the farmer, and cause a resulting rise in the price of food. (N-SEM 4:4)

- The low selling prices of MGA and DAP reflect excess supply capacity and a relatively depressed agricultural economy. (Selling prices of MGA and DAP during the 1980's were included.) U.S. producers eager to maintain high utilization of operating plant capacities have fiercely competed for domestic and export markets. Export and domestic prices have been forced as low as the lowest cost U.S. producers can tolerate. Foreign suppliers, because of lower transport costs, can sell at lower prices. (N-TFI/JAC 15:60)

Response:

EPA recognizes that implementation of Engineering Alternatives 1, 2, and 7 under a Subtitle C framework would impose cost impacts that might be difficult for members of the domestic industry to withstand. The real issue, however, is the magnitude and distribution of the impacts that might be imposed by tailored Subtitle C standards. Under the Subtitle C-Minus scenario presented in both the RTC and the Supplemental Analysis, facilities could achieve compliance by adopting strategies to either contain or reduce/eliminate contaminants in their special wastes. Presumably, they would do so in a manner that minimized costs, given their own operational strategies and site-specific conditions. Therefore, cost estimates provided in the Supplemental Analysis should be viewed as upper-bound estimates; it is very likely that actual costs and associated impacts would be lower than those estimated for the model plant. This fact, coupled with diminished relevance of the cost impacts of full Subtitle C regulation, suggest that many of the claims made by commenters are overstated. To the extent that cost impacts would be moderated, the potential for adverse export/import effects would be reduced or eliminated.

- Several commenters stated that upon implementation of the Alternatives, facilities would no longer be economically viable. (N-OCC 5:2,5,9)(N-IMC 6:5-6)(N-GRD 8:5)(N-TFI/JAC 15:61-62)

  - In 1989 the industry economics yielded a taxable income of $37 per ton P_2O_5. When interest expenses are taken into account, this income is reduced to $11 profit per ton P_2O_5. The average industry operator in 1989 recovered $17 per ton depreciation. When EPA's estimated incremental compliance costs for Alternative 1 of $48.75 per ton P_2O_5 are included, the average operator suffers a cash loss and even fails to recover depreciation. Some operators would find it necessary to restructure debt service or declare bankruptcy. (N-TFI/JAC 15:61-62)

  - Gardinier will be physically and economically unable to operate their facility under Subtitle C. (N-GRD 8:5)

  - The phosphoric acid industry has been very cyclical as to profitability and the manner in which EPA chooses to regulate it may be the economic end to many producers. (N-IMC 6:5-6)

  - Based on the cost impact of the EPA Subtitle C scenarios in the RTC and the "New" Subtitle C Alternatives 1, 2, and 7 in the NODA, it is extremely unlikely that the costs involved would allow for continued operation. (N-OCC 5:2)

  - The operating costs shown in Occidental's June 20, 1990 estimate adjusted for Alternative 1 are appropriate and conservative, even though they are not all inclusive. With the estimated costs Occidental would have no choice but to shut down the operation if required to implement Alternative 1 to meet Subtitle C requirements. The costs could not be "passed along" to the U.S. farmer and certainly not to the export market, a major segment of Occidental sales. (N-OCC 5:9)

  - Occidental has examined an alternative similar to NODA alternative 1 in a report for TFI (June 20, 1990). Based upon assumptions made in that report, the additional cost of

neutralizing process water would be in the range of $45-$65 per ton of P_2O_5. It was concluded "that it is extremely unlikely that the industry could withstand the costs involved and continue to operate". EPA (page 52 of Supplemental Information on Phosphoric Acid Production) estimated $44.05 per ton of P_2O_5 output or $48.72 per ton when adjusted to reflect realistic operating time. While this cost remains prohibitive it is low based on the assumptions made and plant retrofit suggested or deemed required to meet the EPA A-1 scenario. (N-OCC 5:5)

Response:

The Agency recognizes that high compliance costs could threaten the continued operation of many domestic plants.

- Commenters elaborated on the significance of the phosphate fertilizer industry and several suggested that EPA should undertake additional analysis prior to making a regulatory determination. (N-USS 1:1)(N-GRD 8:1)(N-RKJE L2:1)(N-TD L3:1)(N-SEN L4:1)

  - Two phosphate fertilizer producing facilities are located in Idaho. These facilities provide phosphate fertilizer not only to Idaho, but to farmers in the majority of Western states. (N-USS 1:1)

  - Every human, animal, and plant needs phosphate to live. Our nation's crops need phosphorus to provide the agricultural abundance we know today. Only four states have phosphate reserves that are economically and logistically capable of mineral production. These states supply 100 percent of our domestic agricultural needs and should continue to do so as the world demand for food increases. (N-USS 1:1)

  - Gardinier, Inc., through its fertilizer business, directly impacts over 4,000 jobs in a three-county area in western and central Florida with a direct payroll impact of 88 million dollars per year. (N-GRD 8:1)

  - Phosphate fertilizer is important to our nation's farmers. They have an important stake in the outcome of the EPA's deliberations on how to regulate secondary materials from the processing of phosphate rock. (N-TD L3:1)

  - Our nation's crops need phosphorus, nitrogen, and potassium to grow. The 17 companies that sent to EPA a letter dated February 6 supply almost 100 percent of the phosphate fertilizer needs of U.S. farmers. Our grain farmers alone need about a pound of phosphate fertilizer to produce a bushel of corn or wheat. (N-SEN L4:1)

  - Phosphate rock is an important source of fertilizer used by our nation's 2 million farmers. It is a critical component of plant nutrition for a variety of farming operations. Any regulatory change which substantially alters the price or availability of phosphate fertilizers could have a significant impact on agriculture. The Agency should conduct a thorough cost analysis and pay special attention to the impact of potential regulation on farmers who use phosphate fertilizer. (N-RKJE L2:1)

  - Extensive scientific study formed the basis of EPA's decision in 1986 to regulate phosphate rock extraction and beneficiation wastes as non-hazardous and of EPA's tentative conclusion in the Report to Congress that phosphate rock processing wastes should be regulated as non-hazardous. The scientific record should form the foundation for EPA's evaluation of its regulatory options. However, effective regulation must consider the economic impact a change in the current regulatory status of phosphate rock

processing wastes could have on the nation's fertilizer industry and, in turn, on American agriculture. (N-TD L3:1)

- EPA should analyze the costs farmers will bear and the availability of our domestic supply of phosphate fertilizer should EPA reverse its conclusion that phosphate fertilizer processing by-products are non-hazardous. (N-SEN L4:1)

Response:

EPA believes that its understanding of the economic significance of the phosphate fertilizer industry is accurate and complete. The Agency believes that it has taken the potential economic impacts of regulation into account in making its Regulatory Determination.

- It is inconceivable that EPA could offer an Engineering Alternative with immense economic consequences for the entire phosphate industry based upon the unproven assumptions that the treated phosphogypsum slurry would exhibit the same stacking characteristics as existing phosphogypsum slurry, that the treated phosphogypsum slurry would exhibit no hazardous waste characteristics, and that fluosilicic acid could be sold for $100 per ton. The economic viability of the U.S. phosphate industry and thousands of jobs across the country would be affected by the Agency's Regulatory Determination based upon these assumptions. (N-TEX 10:4)

Response:

EPA understands the uncertainties involved in the Engineering Alternatives and has therefore used the proven technology of lined units rather than treatment of the waste in developing revised cost and economic impact estimates in support of today's Regulatory Determination. With regard to the commenter's concerns about fluosilicic acid, EPA has revised its analysis, which is presented in the Technical Background Document assuming that no revenues would be acquired from the sale of FSA.

- Additional information relating to the economic analysis presented in the Supplemental Analysis was submitted by several commenters. (N-TFI/JAC 15:42-47,50-53,56-59,63-68,A)

  - Reported wet process phosphoric acid (WPA) production cost reveals the necessity to make certain adjustments to reflect the total cost of delivering a marketable phosphoric acid product. The processing cost of sulfur to sulfuric acid is adjusted so it can be included in WPA production cost to $34.95 / ton H_2SO_4 and $95.11 / ton P_2O_5. Phosphate rock cost is adjusted for interest to $2.10 / ton captive rock. MGA processing costs are adjusted to include clarification ($3.00 / ton P_2O_5), tank car rental and freight ($10.74 / ton P_2O_5), corporation sales and general administration expense ($20.40 / ton P_2O_5), working capital interest ($8.27 / ton P_2O_5), and interest on loans ($7.50 / ton P_2O_5). (N-TFI/JAC 15:42-47)

  - An article and analysis were included to show the total investment in "sustaining capital" for phosphate processing facilities. Information such as new construction, expansion, and replacement of plant and equipment is included. In the attachment, figures and information on production, employment, investment, general expenditures, exports, transportation, taxes, water, reclamation, and environment are also included. (N-TFI/JAC 15:50-52)

  - An economic analysis was presented including MGA sales price, international sales, domestic sales, and international and domestic average prices. (N-TFI/JAC 15:52-53) The analysis also included:

- A description of Moroccan plants and a comparison of the compliance costs in Morocco to those in the United States; (N-TFI/JAC 15:56-57)

- A brief description of the current average industry economics, including the number of plants, variations among them, uses of WPA, and factors affecting market prices; (N-TFI/JAC 15:58)

- An analysis of current and projected demand, average demand growth, sources of supply, and domestic and international sales of WPA in the form of fertilizer showing that more than 90 percent of the U.S. WPA P_2O_5 production is consumed in various types of fertilizer in domestic and international markets; (N-TFI/JAC 15:58-59)

- Tables containing hypothetical expenses and values of P_2O_5 production, world consumption of P_2O_5, phosphate fertilizer exports, world phosphoric acid plant capacity, MGA selling prices, and DAP selling prices. (N-TFI/JAC 15:63-68)

- Attachment 1 contains the article "Phosphates and Phosphoric Acid, Raw Materials, Technology, and Economics of the Wet Process". (N-JRS 12:A)

Response:

EPA acknowledges receipt of this information but has made no effort to verify or disprove it.

- Several commenters stated that there was no potential for pass-through of costs to consumers. (N-ARC 9:8)(N-TFI/JAC 15:60-61,69)

  - Because of the measures already taken by producers to reduce operating cost and the diminishing investments by the industry to sustain capacity and improve or expand facilities as well as the existence of entire production units that have shut down, there appears to be no reasonable expectation that the industry can pass through additional production costs to suppliers of raw materials, electricity, maintenance and operating materials, or production workers. (N-TFI/JAC 15:60-61)

  - The analysis in the Supplemental Analysis of phosphoric acid producers' ability to pass through Subtitle C compliance costs to their customers fails to consider those firms that have long-term sales agreements that may have terms prohibiting the passing through of such costs. (N-ARC 9:8)

Response:

The potential for pass-through of costs was discussed in the RTC. EPA has no reason to believe that the basis for that discussion has changed.

- A number of commenters stated that markets are not sufficient to support industry-wide FSA recovery. (N-TFI 15:78-83)(N-TFI/Att.3 15:1-3)(N-SEM 4:3)(N-OCC 5:3-5)(N-IMC 6:4)(N-AGR 7:3)(N-GRD 8:2,1A-3A)(N-AGR 11:4)(N-JRS 12:3)

  - Recovery of hydrofluosilicic acid (FSA) as contemplated by Compliance Alternatives 2 and 7 is infeasible and would never be a least-cost alternative for Subtitle C compliance because there is not currently a market for the FSA that would be recovered, nor is there projected to be. The concept that EPA would make a regulatory determination, imposing hundreds of millions of dollars of compliance costs on the industry, on the basis that "new markets (for FSA) could conceivably be created" is objectionable. There is substantial

evidence to indicate both that the current market could not absorb additional recovered FSA and that no substantial new markets could be created in the foreseeable future. The analysis by Gardinier addresses implications of recovered FSA in the hydrofluoric acid industry, environmental and safety concerns relating to the use of recovered FSA, and the technical feasibility and cost issues associated with the recovery of fluorine from existing quantities of phosphoric acid process wastewater. (N-TFI 15:78-83)

- A fluorine market analysis performed by Gardinier, Inc. was included in TFI and Gardinier's comments. The memo presents data demonstrating that the current supply and demand picture for FSA is one of overcapacity. If the total U.S. production for FSA is increased to the projected 1.1MM ST per year, the total demand for fluorine in all markets would be oversupplied by 680M ST per year or by 260 percent. Current price would therefore be reduced to a negligible level. The memo also addresses the environmental concerns posed by shipping this enormous supply of hydrofluoric acid made from the additional fluosilicic acid in rail cars. The increase in handling would result in a skyrocketing of the potential for environmental incident and/or personnel injury. Furthermore, the oversupply of fluorine would have to be disposed. (N-TFI/Att.3 15:1-3)(N-GRD 8:1A-3A)

- There is a low market potential for FSA recovery. Recovery facilities consistently contain excess capacity. Considerable research efforts and monies have been expended over the past 20 years trying to find alternative products to make from recovered FSA. Aside from the limited SiF_4 computer chip market and despite economic incentives, economic alternatives have not been discovered. (N-AGR 7:3)

- Occidental studies of the recovery of FSA did not support recovery and sale of FSA. Based on the quantities shown on the A-2 flowsheet (BD-8451-106-3) the industry could produce ten times the current market demand for FSA. There would be no market and no outlet for FSA. (N-OCC 5:3-5)

- The option of recovering FSA is not economically feasible based on the sale of FSA or conversion to other fluoride projects. The FSA market is saturated. (N-IMC 6:4)(N-GRD 8:2)(N-SEM 4:3)(N-AGR 11:4)(N-JRS 12:3)

- Chevron has learned from two FSA distributors that the market for FSA is currently at 80,000 solution tons/year. The phosphoric acid industry-wide installed FSA production capacity is 190,000 solution tons/year. Distributors advised that by-product FSA would offer no return on investment and the market would become a battle for best freight rates, a battle in which Chevron suffers a distinct disadvantage due to location. The reactor FSA stream would not be marketable due to high levels of impurities. (N-CHEV 13:7)

- The cost data for instituting the Alternatives are often based on offsets from recovering and marketing additional phosphoric acid and fluosilicic acid extrapolated from the regulatory changes. These figures may not adequately reflect the actual revenues projected from the sale of increased acid recovery, the value of which is driven by market trends. (N-DOI L1:1)

- If Subtitle C regulation is imposed, the recovered FSA will become a "derived from" hazardous waste because it will exhibit the characteristic of corrosivity. Pursuant to the so-called "speculative accumulation rule", recovered FSA will eventually have to be managed and stored according to Subtitle C. The industry cannot continue to "store" some 1.1 million short tons per year of recovered 100 percent FSA indefinitely. In fact, it would have to be disposed of as a hazardous waste, requiring neutralization to a pH not less than 3.5. Additional cost would be incurred to construct and operate neutralization

facilities for recovered FSA. Also, given the formation of silica gel as a result of the neutralization of FSA, the treatment sludge would be difficult and costly to manage. (N-TFI 15:78-83)

- Recovered FSA would have to be disposed of as a hazardous waste. Because of the need for disposal, FSA recovery clearly cannot be used as a credit in the EPA cost analysis. In fact, additional cost will be realized from recovery of this product. The neutralization and subsequent disposal of FSA has never been successfully demonstrated. (N-IMC 6:4)(N-GRD 8:2)(N-SEM 4:3)(N-AGR 11:4)(N-JRS 12:3)

Response:

EPA recognizes that current markets are not sufficient to support sales of all of the FSA recovered if the practice were instituted industry-wide. The Agency, therefore, utilized an average credit for sales of recovered FSA of zero dollars per ton in performing its cost analysis in the Supplemental Analysis. This $0 per ton price is intended to reflect an average price assuming that some portion of FSA could be sold for net profit while another portion would have to be managed at a cost. EPA recognizes that there are site-specific differences in the costs of transporting FSA that is to be sold. As a result of these differences, some facilities will be at a disadvantage in selling FSA. FSA recovery of a marketable product is undoubtedly possible, as it is being performed at 5-10 facilities in the U.S. EPA is aware, however, that site-specific variances may render some FSA non-saleable. EPA further recognizes that FSA that could not be sold would require management as a waste (e.g., using lime treatment). Regardless of the risks involved in management and disposal, however, the extent of environmental protection achieved may be greater than that presently reached because the FSA would no longer be managed with the additional cooling water in unlined impoundments.

- An alternative which promotes recovery of additional production would be preferred, as it would allow some return on the capital plant investment while the removal of residual acids from the phosphogypsum would tend to mitigate the impact of stack leachate. However, the actual value of recovered acid will depend on supply and demand cycles. (N-DOI L1:1)

Response:

EPA acknowledges and agrees with this comment.

10.0 EXTENT OF IMPROVEMENT IN ENVIRONMENTAL PROTECTION

- The Agency's management alternatives analysis in the Supplemental Analysis was principally devoted to the economic impacts of the various management options. Similar efforts were not directed toward the environmental benefits of the various waste management alternatives, particularly when compared to the status quo or Subtitle D regulation. Given the environmental degradation caused by this industry as documented in the RTC, it is extremely troubling that EPA does not view the regulatory determination as an opportunity to foster fundamental improvements in the industry's operating practices. (N-NAS/EDF 17:4)

Response:

EPA does view the Regulatory Determination as an important opportunity to facilitate improvement in industry's waste management practices. This is the essence of the waste management alternatives considered in the RTC and the Supplemental Analysis, all of which involved either containment, removal, or fixation of chemical pollutants, so that the wastes in question would not continue to adversely affect the environment.

- Imposition of Subtitle C regulatory controls will result in no improvement in environmental protection and will actually produce significant environmental degradation. (N-TFI 15:114)

Response:

EPA believes that implementation of many of the alternatives considered under the three regulatory scenarios would unambiguously improve the quality of the environment. In other, more limited cases, there is some possibility that full implementation might not result in positive net environmental benefits, for reasons discussed in detail below.

10.1 Environmental Effects of Implementation of Subtitle C

- Implementation of Subtitle C regulation would have perverse environmental effects, such as the following:

  - it would require the industry to spend hundreds of millions of dollars per year to address corrosivity even though the corrosivity of phosphate rock processing wastes is not generally of environmental concern;

  - the Subtitle C program is impotent to address non-hazardous constituents of phosphate rock processing wastes, such as sodium and sulfate; and

  - the regulatory compliance scenarios proposed by EPA will exacerbate the potential for environmental migration of sodium and sulfate, because implementation will increase the concentration of sodium in phosphate rock processing wastes and will require the construction of new, unlined impoundments that would become potential new sources of leachate containing these constituents.

  Subtitle D, on the other hand, will be able to efficiently and effectively address any environmental concerns that might be associated with both hazardous and non-hazardous constituents of phosphate rock processing wastes. (N-TFI 15:114-115)

- The engineering alternatives offered in the NODA do not protect the environment from sodium and sulfate intrusion and will actually increase the potential of environmental pollution, including sodium migration. (N-IMC 6:3,5-6)(N-GRD 8:2)

Response:

EPA generally disagrees. First, corrosivity is of concern to the Agency, both because acidic materials can be harmful to humans and other organisms and because acidic wastewaters can leach toxic heavy metals from soils and other materials with which they come into contact. Therefore, the commenter's statement is contrary to long-standing EPA policy. Secondly, contrary to the commenter's statement, RCRA Subtitle C is not incapable of controlling risk from so-called "non-hazardous" constituents, particularly from the standpoint of corrective action, where such considerations are likely to be of greatest importance. The Agency believes that it has the authority under Subtitle C to require corrective action to protect/restore, for example, ground-water resources that have been contaminated above primary drinking water standards, where they exist, by non-hazardous constituents such as sodium (see EPA's corrective action analysis in the document entitled Technical Background Document : Data and Analyses in Support of the Regulatory Determination for Special Wastes from Phosphoric Acid Production for a more complete treatment of this issue). Finally, EPA now believes, as suggested by commenters, that treatment residue impoundments would probably have to be lined, at least in some states. This would obviate any concerns related to releases of higher concentrations of mobile ions to ground water.

- Environmental impacts of the NODA Alternatives, based on Occidental experience with the NEPA process, appear to be of greater significance than the original "sources" - phosphoric acid plants built for efficiency and minimum environmental impact based on years of experience in operation and design. (N-OCC 5:3)

Response:

The environmental impacts of lined waste management units (included in several of the engineering alternatives) are of demonstrably lesser magnitude than those imparted by the plants currently in operation, most of which have significantly contaminated underlying and adjacent ground-water resources.

10.2 Installation of Unreclaimable Sludge Ponds under Subtitle C

- Imposition of Subtitle C regulation will require the installation of tens of thousands of acres of unreclaimable sludge ponds. It is extremely unlikely that these sludge ponds could ever be reclaimed. (N-TFI 15:115-116)

- It is inconceivable that EPA would suggest an alternative that would require the industry to install 17,188 acres of unreclaimable sludge ponds between Orlando and Tampa. The Florida environmental authorities would frown upon such a result. (N-TFI 15:117)

Response:

EPA is not convinced that the scenario described by commenters would necessarily occur. Nonetheless, the Agency is concerned about the prospect of creating the need for substantially larger areas committed for waste disposal in the phosphoric acid industry, and plans to explore this issue further in the future.

10.3 Environmental Effects of Increased Demand for Lime

- Imposition of Subtitle C regulation will produce significant adverse environmental effects as a result of increased demand for lime. Implementation of Alternative 1 would, in the first year, require 12,886 tons per day of lime in the southeast United States. The southeastern U.S. lime production industry would be required to nearly triple its operating capacity during the first year.

The generation of the greenhouse gas carbon dioxide would increase by almost 10,000 tons per day. Fuel consumption would increase substantially, both as a result of the calcining of lime rock and the hauling of quick lime. Some 390 acres per year of additional lime strip mines would require reclamation. (N-TFI 15:117-118)

- The total tons per day of lime required will be 333 in year 1, 236 in years 2-5, and 196 in years 6-15, or a first year industry requirements of 12,886 tpd and a longer term requirement of 9,867 tpd. The maximum present production capacity of lime is $2.25(10_6)$ tpy. If the SE U.S. quicklime industry were currently operating at or near capacity, it would have to more than double its capacity to meet just the Florida requirement during the first year of implementation of Alternative 1. To satisfy the demand of phosphate operations throughout the SE U.S., while supplying its existing market, the industry would require nearly triple its present capacity. As a result of lime production and hauling, greenhouse gas production would equal 9,654 tpd CO_2. Fuel consumption from calcining limerock and hauling quicklime would also be greatly increased. Moreover, the stripmine reclamation requirement would be 390 acres per year. (N-TFI/JAC 15:27-31)

- Lime processing consumes about 7.5 million Btu per ton of lime produced. Applying EPA's liming scenario would consume almost 690 billion Btu per year in lime production. The neutralization scenario indirectly causes worse pollution than it eliminates in at least two ways: coal must be burned to produce electricity for lime production and lime must be mined, processed, and transported. When neutralization is compared to current phosphoric acid plant operation, neutralization will cause an emission of 817,500 lb/yr of particulates (almost 6,000 times that generated by current phosphoric acid plant operation), 42,300 lb/yr of SO_x (over 20 times current operation), 294,500 lb/yr of NO_x (over 34 times current operation), and 177,500 lb/yr of CO (almost 300 times current operation). (N-CHEV 13:5-6)

Response:

The Agency acknowledges that implementation of any alternative that substantially increased the demand for lime would result in increased energy consumption and releases of carbon dioxide, a "greenhouse" gas, to the atmosphere. EPA, however, is not convinced that opening of additional limestone mines would necessarily be required to any significant degree as a result of implementation of the engineering alternatives, though additional production from existing mines would clearly be needed. EPA is aware of the uncertainties involved in lime treatment, however, and has therefore considered only the proven technologies of lining waste management units for the purposes of today's notice, making the issue of environmental effects of increased lime demand moot in the Regulatory Determination decision.

10.4 Effect of Subtitle C Regulation on Discharges of Treated Water

- Subtitle C regulation will increase discharges of treated wastewater in the form of increased discharge of treated phosphoric acid production process wastewater. These discharges would not be in accord with the spirit, if not the letter, of the Clean Water Act. (N-TFI 15:84-90,118)(N-SEM 4:3-4)(N-OCC 5:4)(N-GRD 8:2)

  - In Alternative 7, EPA significantly underestimated the amount of process wastewater requiring treatment and discharge. Industry-wide FSA recovery is infeasible and therefore an additional 252 TPD of process wastewater would have to be treated and discharged rather than removed from the system as part of recovered FSA. These daily discharges of treated process wastewater (3,121 TPD) present serious issues of compliance with applicable Clean Water Act requirements. (N-TFI 15:84-90)(N-SEM 4:3-4)

- The mounds of groundwater data submitted from Florida indicate that sodium and sulfates are the elements and compounds of concern. The NODA alternatives increase the amounts of waste disposal of sodium and sulfate and related discharges. There is no information that the corrosive nature of the waste streams are causing any environmental damage. Again, each state will be better suited to address the environmental issues for their site specific cases. (N-GRD 8:2)

- Heat used to evaporate water from the existing surge/cooling pond would go out the cooling tower by evaporation of fresh groundwater thus decreasing the negative balance in the pond which would lead to excessive treatment and discharge to the environment. This is in conflict with the intent, if not the letter, of the Clean Water Act. (N-OCC 5:4)

Response:

EPA recognizes that implementation of the engineering alternatives involving waste treatment would necessarily require adjustments in plant water use and management. As reflected in the Supplemental Analysis, however, it may be possible for individual facilities to reconfigure their internal water management systems so as to avoid discharge. The Agency believes that the statements that affected facilities would have no choice but to discharge treated process wastewater are not substantiated.

10.5 Effect of Subtitle C Regulation on Volume of Phosphogypsum Slurry

- Subtitle C regulation will dramatically increase the volume of phosphogypsum slurry requiring management since the volume of neutralized phosphogypsum slurry will be greater than that of the unneutralized slurry. (N-TFI 15:119)

Response:

EPA estimates show that the incremental volume of solids requiring co-disposal with the phosphogypsum is on the order of a few percent, at most.

10.6 Effect of Subtitle C Regulation on Ground-Water Withdrawals

- Subtitle C regulation will require additional withdrawals of groundwater. The environmental consequences of this substantial increased groundwater demand have not been considered by EPA. (N-TFI 15:119)

- The additional amount of fresh water which would be required to slake the lime used in neutralization would create water balance problems. Groundwater depletion is already of critical concern in Florida and additional groundwater requirements would be critically reviewed by the water management district. (N-SEM 4:2)

Response:

EPA recognizes that, at least in the short term, water use would increase upon implementation of the alternatives involving lime treatment. In the longer term, however, the Agency believes that the lime required for waste treatment could be slaked with water provided by internal plant sources. Obviously, impacts on water balance, including increments in make-up water required, would vary from plant to plant.

Additional Groundwater Required by a Cooling Tower

- Generally, and particularly in Florida, the demand for fresh water for use as cooling tower make-up would require pumping groundwater. This additional demand for groundwater is directly contrary to the environmental objective of minimizing the withdrawal and use of groundwater. (TFI 15:84-90)

- A cooling tower (Alternative 7) adds significantly to the consumptive use of groundwater (some 4 million gallons per day based on the A-7 flowsheet, BD 8451-106-4A and adjusted for the Occidental production rate). (N-OCC 5:4)

- The minimum amount of fresh water which the cooling tower itself consumes is the evaporation plus the blowdown. The remainder of fresh water fed to the cooling tower is shown by the Process Flow Diagram as being required by the process. The net additional fresh water consumption attributable to Alternative 7 is 1,064,000 gallons per day, supplied, in areas such as Florida, by increased groundwater withdrawal. (N-TFI/JAC 15:34-35)

    - It is extremely unlikely that the relevant state and local authorities in Florida would permit the withdrawal of this additional groundwater. (N-TFI 15:84-90)

Response:

The Agency acknowledges that use of a cooling tower would likely increase cooling water consumption and necessitate a greater ground-water withdrawal rate than generally occurs at present. EPA realizes that increased ground-water withdrawal rates are not ideal, but believes that on balance, the impacts of incremental ground-water withdrawals would probably be preferable to continued ground-water contamination through current process wastewater management practices. Officials with the FDER have indicated that ground-water withdrawal restrictions probably would exist at Gardinier's facility in E. Tampa, since it is near or may be within the designated Most Impacted Area of the E. Tampa Bay Water Use Caution Area. No definite determination can be made about which facilities would be restricted from increased ground-water withdrawal, however, since facilities would have to apply individually to the Water Use Board for a Water Use Permit (WUP) modification. According to State officials, it is quite conceivable that such permit modifications would be granted for the Polk County facilities. In any case, this issue is not germane to today's Regulatory Determination, because EPA has not relied upon the treatment alternatives that might require increased ground-water withdrawals in making the regulatory decisions.

10.7 Need for an Environmental Impact Statement to Support A Subtitle C Regulatory Determination

- An EIS would be required to support a Subtitle C regulatory determination. A major retrofit of the production and waste management facilities at existing phosphate rock processing plants would be required. This may constitute a major modification for purposes of the NPDES permits held by most existing facilities. If so, an Environmental Impact Statement may be required to implement the compliance alternatives. Even if this is not the case, EPA should consider conducting a similar analysis to obtain a more complete picture of the environmental consequences of the alternatives, as their implementation may have a substantially greater potential for adverse environmental impacts than the facilities themselves. The environmental benefits of the alternatives are, at best, ephemeral. However, adverse impacts are real and substantial. This tradeoff must be considered by EPA. (N-TFI 15:119-120)

Response:

EPA has decided that Subtitle C regulation of the phosphoric acid special wastes is not appropriate, rendering this issue moot.

11.0 TRIP REPORTS

Gardinier

- Gardinier made a number of corrections to the trip report for that facility:
  - The EPA summary of their visit to Gardinier contains numerous errors. Specifically, they repeatedly confused the new and old gypsum fields. (N-GRD 8:3)
  - On page A4-3, line 1, EPA incorrectly states that Gardinier recovers fluosilicic acid from the reactor. This is incorrect, FSA is only recovered from evaporators. (N-GRD 8:4)
  - Contrary to a statement on page A4-3, paragraph 1, line 2, the closure permit does not apply to the new stack. (N-GRD 8:4)
  - Contrary to a statement on page A4-3, paragraph 2, line 5, the stack is not a dry stack. As with the old stack, the gypsum is transported to the field as a slurry containing approximately 30 percent solids. (N-GRD 8:4)
  - The statements on page A4-3, paragraph 2, line regarding saltwater inversion form Tampa Bay and regarding dewatering equilibrium both refer to the old gypsum stack. (N-GRD 8:4)
  - Paragraph 3 on page A4-3 has confused a hypothetical dry stack with the new gypsum stack. The new stack is a wet process which provides for the greatest degree of stability. As has been explained to EPA, gypsum compaction is facilitated by the wet stacking methods employed by Gardinier in the operation of the new gypsum stack. (N-GRD 8:4)
  - The stormwater management system on the new gypsum stack has been incorrectly described on page A4-3, paragraph 4. Stormwater contacting exposed gypsum at the new field will be directed to the process water system. The first flush of stormwater landing on the grassed side slopes of the stack is retained and drains into the recycle system as described. Excess rainfall landing on grassed side slopes will enter a monitored runoff swale and be directed to a permitted outfall. (N-GRD 8:4)
  - Paragraph 1 on page A4-4 has confused the gypsum transport system and the field underdrain/leachate collection systems. Seepage form the field is collected by lateral drains located above the field liner. Each drain is buried in a sand bed which connects to a blanket sand drain running the entire perimeter of the field. These redundant drainage systems deliver the seepage to the leachate pit. The gypsum slurry is delivered to the field by HDPE pipes. A dry transport system is not employed. However, contrary to the summary, cost of the conveyor system is not the only consideration. As EPA is aware, stacking of dry gypsum will result in inconsistent compaction and poor field stability. Such stacking would require significantly more land due to reduced stack heights. In addition, dry stacking would result in fugitive particulate emissions. (N-GRD 8:4)
  - The volumes of process water in the stack are incorrectly stated on page A4-4, paragraph 3, line 4. An estimated 6.2 billion gallons of process water were stored in the gypsum field prior to closure. Using measured effective porosities with depth, the total amount of water that will ultimately drain from the gypsum is approximately 1.6 billion gallons. (N-GRD 8:5)
  - The reference to the dollars spent on ground water protection on page A4-4, paragraph 6, last line is for the new field and represents the total cost of the new field. (N-GRD 8:5)

- The sources of process water are incorrectly stated on page A4-4, last paragraph as coming from fresh spring water. The primary source of makeup water for the ball mill is blowdown from the sulfuric acid plant cooling towers and seal water from vacuum pumps. The pall mill supply water is correctly identified on page A4-3, paragraph 4. (N-GRD 8:5)

- Contrary to a statement on page A4-5, the process water recycle rate is closer to 60,000 gpm rather than the 1,000 gpm stated in the Gardinier trip report. (N-GRD 8:5)

Response:

EPA has not attempted to verify this information, but believes that it will not significantly impact its Regulatory Determination.

Agrico

- EPA staff and contractors, in preparing the Phosphoric Acid Report, visited two of Agrico's Louisiana facilities, representing an unprecedented degree of analysis of the industry and operations. (N-AGR 7:1)

Response:

EPA acknowledges this comment.

Agrico - Uncle Sam

- Agrico made a number of corrections to the trip report for its Uncle Sam facility:

  - On Page A5-1, in the trip report for Agrico's Uncle Sam plant, in the 4th paragraph in the overview of plant production operation, sulfuric acid should be added as a product in the first sentence. (N-AGR 7:3)

  - On Page A5-2, in the trip report for Agrico's Uncle Sam plant, in the 2nd full paragraph, the fourth sentence should be changed to read: "This contact cooling water in equilibrium with fluorides, and..." (N-AGR 7:3)

  - On Page A5-2, in the trip report for Agrico's Uncle Sam plant, in the 5th full paragraph, "gypsum sump" should be referred to as "gypsum tank." (N-AGR 7:3)

  - On Page A5-3, in the trip report for Agrico's Uncle Sam plant, in the 1st paragraph, "gypsum sump" should be referred to as "gypsum tank." (N-AGR 7:3)

  - On Page A5-3, in the trip report for Agrico's Uncle Sam plant, in the last sentence of the 2nd paragraph, it should be noted that yellow cake is not sized prior to drumming. (N-AGR 7:4)

  - In the section entitled Highlights of Waste Management Practices for the Uncle Sam facility, paragraph 1 should read "Inactive stack pondwater is collected separately from the active stack water and discharged when not required." Further, the plant discharges from the inactive area only when necessary to maintain acceptable water level in the inactive pond. (N-AGR 7:4)

Response:

EPA has not attempted to verify this information, but believes that it will not significantly impact its Regulatory Determination.

Agrico - Faustina

- Agrico made a number of corrections to the trip report for its Donaldsonville facility:

  - On Page A6-1, in the trip report for Agrico's Faustina facility, it should be noted that the Faustina facility is located near the town of Donaldsonville, not in it. (N-AGR 7:4)

  - On Page A6-2, in the trip report for Agrico's Faustina facility, in the 2nd full paragraph, "(approximately 2,000 gpm)" should read "(approximately 2,000 gpm each)." (N-AGR 7:4)

  - On Page A6-2, in the trip report for Agrico's Faustina facility, in the 2nd full paragraph, "to wash the gypsum on the filter (approximately 1,000 gpm to 1,200 gpm)" should read "(approximately 1,200 gpm to 1,500 gpm)" and in the same paragraph, the sentence which reads "... or routed via the granulation pond" should read "or flows by gravity directly to the cooling pond." In the same paragraph, the sentence fragment which reads "...to the cooling pond (approximately 1,000 gpm)" should read "to the cooling pond (approximately 1,500 gpm)." (N-AGR 7:4)

  - On Page A6-3, in the trip report for Agrico's Faustina facility, "gypsum sump" should read "gypsum tank" in two places in the top carry-over paragraph. In the fourth sentence of the 1st full paragraph, the word "centrifuge" should read "gravity settler." (N-AGR 7:4)

  - In the Highlights of Waste Management Practices section on the Faustina facility, first paragraph, the "100 feet" should read "35 feet." In the second paragraph, the "97-acre cooling pond" should be an "80-acre cooling pond." The "54,000 gpm" should read "52,400 gpm." (N-AGR 7:4)

  - On Page A6-4, it is not correct to say that the liming plant has "never been used to treat water for discharge." (N-AGR 7:4)

Response:

EPA has not attempted to verify this information, but believes that it will not significantly impact its Regulatory Determination.

IMC

- There are several minor concentration errors in the IMC trip report. The statement in the uranium recovery section that IMC is under contract with the Federal Government to extract uranium oxide is incorrect. IMC's contracts for the extraction of uranium oxide are with electric utilities. (N-IMC 6:5)

Response:

EPA has not attempted to verify this information, but believes that it will not significantly impact its Regulatory Determination.

Texasgulf

- A number of changes and corrections should be made to the EPA Supplemental Analysis regarding the Texasgulf plant visit to provide a more accurate basis for its regulatory determination for mineral processing wastes. (N-TEX 10:10):

  - Texasgulf produces "amber" acid with phosphate feed that has not been processed through the calcine operation. Page A1-3 of the EPA Supplemental Analysis states that "feed that goes directly to the acid operation is used to make "black" acid. (N-TEX 10:8)

  - Texasgulf utilizes treated depressurization water to produce sulfuric acid. This water is processed through lime softeners before entering the Sulfuric Acid Plants. Page A1-3 of the EPA Supplemental Analysis states that "fresh water is used to make the acid, but must be purified in a lime softening and ion exchange operation. (N-TEX 10:8-9)

  - Currently the regeneration water from the ion exchange operation at Texasgulf is discharged via an NPDES out fall. Under Texasgulf's new water management plan, this water (6 - 9 pH) will go to the Elementary Neutralization Facility (ENF) and mix with the blowdown from the lime softeners (10 pH). The combined flow will be pumped to Texasgulf's reclamation operation. Page A1-3 of the EPA Supplemental Analysis stated that "under the new water management plan this water will go to the Neutralization Plant (it has a PH of about 10)". (N-TEX 10:9)

  - The Water Treatment Plant at Texasgulf consists of several lime softeners and several ion exchange columns. An Elementary Neutralization Facility (ENF) was constructed adjacent to the Water Treatment Plant. On page A1-4 of the EPA Supplemental Analysis the ENF is mistakenly referred to as the Water Treatment Plant. (N-TEX 10:9)

  - The only waste generated at Texasgulf's Purified Acid Plant is cooling tower blowdown. This blowdown is pumped to the No. 2 Cooling Pond. On page A1-5 of the EPA Supplemental Analysis it states "the cooling tower blowdown which goes to the Neutralization Plant." (N-TEX 10:9-10)

Response:

EPA has not attempted to verify this information, but believes that it will not significantly impact its Regulatory Determination.

12.0 NODA COMMENTS ADDRESSING NON-PHOSPHORIC ACID ISSUES

12.1 General Findings

- The supplemental information reinforces the case for hazardous waste regulation for at least 11 of the mineral processing wastes studied in the RTC and discussed in the October 1990 Comments. These wastes pose significant risks to human health and the environment, and state regulatory programs governing these wastes are inadequate. Suggestions by EPA in the RTC that states now appear willing to improve their programs remain unsupported. Only one action occurred in one of the 29 states in the 6 months following the RTC. This is a proposed Florida regulation for phosphoric acid production wastes and NAS/EDF believes that Florida is reconsidering the proposal. The lack of state regulation is further proof that hazardous waste regulation is warranted. (N-NAS/EDF 17:4-5)

Response:

EPA has taken into account both the risk to human health and the environment and the adequacy of state regulatory programs in making its Regulatory Determination for each of the 20 special wastes, including the 11 mentioned by the commenter. The Agency does not believe that either the nature of state regulation or the supplemental information justify Subtitle C regulation for any of the wastes. The justification for EPA's decision for each of the individual wastes is discussed in detail in the Regulatory Determination.

12.2 Ferrous Metals

12.2.1 Industry Overview

12.2.2 Production Statistics

- Two commenters believed that there were errors in the production figures given for their facilities in the NODA. (N-INST 3:1-2)(N-AISI 18:1)

  - Tables I and II of the supplemental report on carbon steel production addressing carbon steel production at the Acme facility should be changed to 780,349 MT/YR. The waste quantities shown in both tables are correct but the change in tonnage alters the waste-to-product ratios for the facility in the RTC Data and Supplemental Data columns to 0.019 and 0.022, respectively. (N-AISI 18:1)

  - Tables II and III of the supplemental report on carbon steel production stated that Inland Steel's production was 2,780,522 mt/yr. Based on 1989 data, Inland Steel stated that its production was 4,481,040 mt/yr. (N-INST 3:1-2)

Response:

All of the production statistics listed in Tables I, II, and III are for 1988. It is not clear that the new production number submitted by Acme is for 1988, therefore it is uncertain if the production quantity given in the NODA for that facility is actually in error. The figure submitted by Inland Steel is for 1989, not 1988, and therefore is not a valid correction. Although EPA has not attempted to verify the information contained in these comments, it does not believe that the suggested changes would significantly alter its analytical findings.

12.2.3 Waste Characteristics, Generation, and Current Management Practices

12.2.3.1 Waste Characteristics

- Steel APC dust/sludge contains mostly iron and very little high value recoverable material. Non-generators will have no material recovery incentive in treating these wastes. (N-INST 3:2)

Response:

EPA acknowledges this comment, but does not believe that it would significantly alter its analysis or affect its Regulatory Determination.

12.2.3.2 Waste Generation

- In the report entitled "Supplemental Information on Generation and Management of Basic Oxygen Furnace and Open Hearth Furnace Air Pollution Control Dust and Sludge From Carbon Steel Production," Tables II and III stated that Inland Steel generated 128,094 mt/yr of waste, 5,987 mt/yr of dust and 122,197 mt/yr of sludge with a waste-to-product ratio of 0.151. For 1989, these figures should be 127,118 mt/yr, 101,626 mt/yr, 25,492 mt/yr, and 0.028, respectively. (N-INST 3:1-2)

Response:

EPA has not attempted to verify the information contained in this comment, but notes that the suggested changes represent a change of less than 1,000 mt in the total waste generation for that facility. Therefore, EPA does not believe that these changes would significantly alter its analysis.

- Examination of EPA's additional data reveals that the industry trade association allegedly misreported waste generation data by more than a factor of three (see Table II) for Inland Steel and US Steel, the two facilities generating the largest volume of steel APC dusts/sludges. Because the waste generation data are most uncertain for the two plants with the highest waste generation rates, EPA, to be conservative, should use the smaller number to determine if the waste meets the "high volume" criteria. When the lower number is used for calculation purposes, the average generation rate changes from 63,000 to 48,431 MT/year. The 48,431 figure barely exceeds the "high volume" threshold of 45,000 MT/year per facility for non-liquid wastes, showing that steel APC dust/sludges are generated at rates roughly the same as wastes that do not qualify for the Mining Waste Exclusion. The new waste management data also provide further support for regulating the waste under RCRA Subtitle C. (N-NAS/EDF 17:1-2)

Response:

EPA disagrees that it should use the lower waste generation numbers for both of the facilities in question. Using the lower generation number for US Steel would mean using a number for that facility which is clearly in error based on the information reported in the follow-up to the SWMPF Survey and which AISI verified is incorrect. Using this figure would be inaccurate, not "conservative." EPA has appropriately used the most accurate information available in calculating the average waste generation in its supplemental analysis. In addition, the issue of waste generation rate is relevant only within the context of determining eligibility for the Mining Waste Exclusion. EPA determined in the rulemakings preceding the RTC that steel APC dust/sludge meets the special waste criteria, including the high volume criterion. The Agency has concluded, after detailed study and analysis of public comments, that Subtitle C regulation is not warranted for this waste, because, although intrinsic hazard is relatively high, potential risks are low and because the Agency found no documented damages associated with the waste. EPA has taken the supplemental waste management data into account in making its Regulatory Determination, but

does not believe that this information justifies regulation of steel APC dust/sludge under Subtitle C.

12.2.3.3 Current Management Practices

- The supplemental information document provides updated and corrected information with respect to the generation and disposition of basic oxygen furnace and open hearth furnace dusts and sludges. These changes result in greater amounts of material being disposed on-site and off-site than previously believed and less material returned to the process or sold than previously believed. However, the total quantity of material disposed is approximately the same as previously estimated and, more importantly, the more current information on the disposition of these materials has no bearing on the characteristics of the wastes. (N-AISI 18:2)

Response:

The commenter is correct that the supplemental report on steel APC dust/sludge provides updated information, including data showing that more of the waste is disposed and less is returned to the process or sold than previously reported. EPA agrees that the total quantity of waste generated is the same as previously estimated. However, while the Agency agrees that the updated information on waste management has no bearing on the physical characteristics (or intrinsic hazard) of the waste, waste disposal practices do have a bearing on the potential for exposure and environmental impact. It is for this reason that EPA has taken the new information on waste management into account in making the Regulatory Determination, and has determined that this information does not justify Subtitle C regulation.

- Shifts from on-site to off-site or off-site to on-site disposal do not reflect any meaningful change in management practices. In some cases, the off-site facilities are also owned and operated by the steel companies. Handling practices would be expected to be similar or identical and would likely be undertaken by the same materials handling firms. EPA should not feel compelled to reevaluate in the context of the mineral processing waste exclusion, the on-site/off-site issue in terms of the criteria used in assessing mineral processing wastes. (N-AISI 18:2)

Response:

EPA does not have complete data on the ownership of off-site disposal facilities used for steel APC dust/sludge. EPA is not willing to assume that waste management practices at off-site disposal facilities are identical to those used on-site, particularly in the absence of data or other documentation. EPA therefore factored the potential hazards associated with off-site disposal into its analysis in the RTC, and has similarly taken these potential hazards into account in making its Regulatory Determination, especially given the new waste management information presented in the NODA. Because, however, the analysis presented in the RTC addressed the majority of facilities and <u>all</u> known waste management practices, and because no documented damages have been associated with the waste, EPA does not believe that the new information on the prevalence of off-site disposal materially affects EPA's risk assessment conclusions.

- There are errors in the information in the NODA concerning waste management at several steel facilities. (N-INST 3:1-2)(N-AISI 18:1)

  - The waste quantity shown for Warren Steel in Table III of the supplemental report addressing carbon steel production is disposed on-site, not off-site as reported in the NODA. (N-AISI 18:1)

  - According to tables II and III of the supplemental report on carbon steel production, Inland Steel managed its waste in on-site and off-site landfills, but data were not available

as to the quantity of waste managed. In actuality, all waste (127,118 mt/yr) was managed on site; none was disposed off site, recycled, or sold. (N-INST 3:1-2)

Response:

EPA has not attempted to verify the information concerning waste management at Warren Steel and Inland Steel, but does not believe it would significantly alter the analysis.

12.2.4 Potential and Documented Danger to Human Health and the Environment

12.2.4.1 Risks

- NAS and EDF have previously argued that the RTC understated the risks associated with steel APC dust/sludge. According to EPA's supplemental data, a considerably larger quantity of this waste was sent to off-site landfills than was reported in the RTC. As the RTC did not assess the risks poses by off-site disposal, it is likely that there have been environmental and/or human health damages caused by off-site management of the waste that were not considered by EPA. (N-NAS/EDF 17:2)

Response:

While the Agency acknowledges that it did not rigorously model the risks associated with off-site disposal of steel APC dust/sludge, it disagrees that its consideration of these risks in the RTC was inadequate. EPA evaluated the observed and potential hazards associated with off-site disposal of both iron and steel APC dust/sludge in the context of those wastes' damage case record and intrinsic hazard. In the RTC's evaluation of the likelihood that existing risks and impacts would continue in the absence of further regulation, EPA noted the possibility that dust/sludge management at some off-site locations may present a threat to human health or the environment. The Agency continues to believe that its analysis of the threats posed by both on-site and off-site waste management was adequately broad and representative to support an overall conclusion that risks posed by this waste are relatively low.

12.2.4.2 Damage Cases

- It is disappointing that EPA did not seek out additional information on damage cases from steel APC dust/sludges, since such information, though clearly available, was visibly lacking in the RTC. It would have been helpful if additional damage case information had been included in this Federal Register notice, including the October 16, 1990 administrative orders issued against Bethlehem Steel and Inland Steel, submitted to the RCRA docket by EDF in a letter dated December 3, 1990. (N-NAS/EDF 17:2)

Response:

EPA believes that the RTC's review of damage cases was comprehensive. EPA has reviewed the commenter's December 3, 1990 letter. The information submitted along with this letter is not relevant to steel APC dust/sludge and therefore has no bearing upon the Agency's Regulatory Determination. This is because the information does not refer, either specifically or indirectly, to the special wastes in question; the information does refer to several other distinct wastes from the steel production process.

12.2.5 Waste Management Alternatives and Potential Utilization

- Zinc can adversely affect the refractory linings of blast furnaces. Any zinc must be extracted before the dusts/sludge could be returned as a blast furnace feed. Zinc removal costs by outside

hazardous waste processors would make such feeds uncompetitive with other blast furnace feeds. The option then would be to dispose of the material in an MTR facility which would then add significantly to steel manufacturing costs. (N-INST 3:2)

Response:

EPA acknowledges this additional information. EPA understands that, at some facilities, returning steel APC dust/sludge to the production process may not be economically feasible. Although the RTC did not consider the practice in its economic analysis, this concern was recognized in the supplemental report on this waste. Thus, EPA does not believe that this additional information would significantly alter its basic findings.

12.2.6 Findings About Specific Waste Streams

- Commenters argued both for and against Subtitle C regulation based on findings in the RTC and NODA supplemental data. (N-INST 3:2)(N-NAS/EDF 17:1)

  - The additional information obtained by EPA on waste generation and management of steel air pollution control (APC) dusts/sludges does not change the position of the NAS and EDF that this waste should be regulated under Subtitle C of RCRA. (N-NAS/EDF 17:1)

  - The supplemental information provided by Inland Steel should not change EPA's conclusion that iron blast furnace slag, steel furnace slag, iron blast furnace APC dust/sludge, and steel furnace APC dust/sludge would generally not be subject to regulation as a hazardous waste. (N-INST 3:2)

  - Comments in the NODA that suggest that listing of a waste as "hazardous" encourages recycling are incorrect. Steel APC dust/sludge is generated in large volumes. A designation as "hazardous" will limit options and add regulatory costs (permitting, corrective actions, etc.) that discourage recycling. (N-INST 3:2)

Response:

Based on a review of information in the RTC, the supplemental analysis presented in the NODA, and public comments, EPA concludes that Subtitle C regulation is unwarranted for steel APC dust/sludge. The waste rarely exhibits a characteristic of hazardous waste. Moreover, although existing management practices and environmental conditions allow for the potential for environmental releases at certain facilities, the lack of damage cases indicates that the potential for adverse effects is not significant. Thus, EPA plans to pursue approaches for making sure that steel APC dust/sludge management is protective, but believes that this objective can best be accomplished under Subtitle D.

12.3 Titanium Tetrachloride

12.3.1 Potential and Documented Danger to Human Health and the Environment

12.3.1.1 Risks

- In addition to the reasons set forth in the October 1990 Comments, chloride process waste solids warrant hazardous waste regulation because the Agency had previously listed the waste as hazardous. The Agency subsequently delisted chloride process waste solids based on the Agency's belief at the time that trivalent chromium did not pose a substantial risk to human health and the environment. On several occasions since the October 1980 delisting, the Agency has

acknowledged that its technical justification for the delisting was inappropriate, but the Agency has not yet taken formal action to relist K074 and/or remove the characteristic exclusion. There is no evidence presented in the RTC that the original listing was either improper or technically unsound. Given the Agency's scientific reevaluation of the need to regulate wastes for the presence of total chromium, the characteristic exclusion must be removed for the titanium tetrachloride wastes (and the other delisted tannery wastes). (N-NAS/EDF 17:2-3)

Response:

EPA has confirmed that the chromium in titanium tetrachloride waste solids is exempt from Subtitle C regulation by 40 CFR §261.4, which exempts wastes that are hazardous only because they exhibit the EP toxicity characteristic for chromium, contain only trivalent chromium, and are managed in non-oxidizing environments. EPA plans to re-evaluate this exemption, and may at that time reconsider its Regulatory Determination for titanium tetrachloride waste solids. Until such time as EPA takes formal action to remove the characteristic exclusion, the chromium in chloride process waste solids will remain exempt under 40 CFR §261.4(b)(6)(i)(A). Furthermore, EPA has concluded in its Regulatory Determination that Subtitle C regulation of chloride process waste solids is not warranted because current on-site management practices do not pose a significant risk and are not likely to cause significant problems in the future. If, when EPA reevaluates the trivalent chromium exemption, it finds that the exemption is not protective of human health and the environment, the Agency will reconsider its Subtitle D determination for chloride process waste solids.